目标与成功指南

埃隆·马斯克最具实用价值的思想，

亲述版

埃隆之书 纳瓦尔·拉维坎特序

系列销量100万以上

埃里克·乔根森

视觉设计：杰克·布彻

更多资源 https://mirrorsite.org

ALSO FROM THE AUTHOR: 作者其他作品：

The Almanack of Naval Ravikant: A Guide to Wealth and Happiness 《纳瓦尔宝典：财富与幸福指南》

The Anthology of Balaji: A Guide to Technology, Truth, and Building the Future 《巴拉吉选集：技术、真理与构建未来指南》

更多资源 https://mirrorsite.org

COPYRIGHT © 2026 ERIC JORGENSON

版权 © 2026 埃里克·乔根森

All rights reserved.

保留所有权利。

FIRST EDITION

第一版

ISBN: 978-1-5445-5076-3

ISBN： 978-1-5445-5076-3

更多资源 https://mirrorsite.org

FOR MY PROGENY…

致我的后代……

THE REASON I DO (ALMOST) EVERYTHING.

我（ 几乎） 做所有事情的原因。

更多资源 https://mirrorsite.org

CONTENTS

目录

NOTES ON THIS BOOK

本书说明

FOREWORD

前言

ERIC'S WELCOME TO THIS BOOK

埃里克欢迎辞

更多资源 https://mirrorsite.org

PART I: PURSUE PURPOSE

部件一：追寻目标

LIVING A PURPOSEFUL LIFE

活出目标人生

Be Useful

发挥价值

Fight for the Future

为未来而战

Obsess for Success

为成功痴狂

Start Before the World Is Ready

先于世界准备而动

Create More than You Consume

创造大于消耗

Work like Hell

拼命工作

Feel the Fear; Do It Anyway

直面恐惧 勇往直前

Seek the Nature of the Universe

探寻宇宙本质

THINK LIKE A PHYSICIST

更多资源 https://mirrorsite.org

物理学家式思考

Obsess over Truth

真理至上

First-Principles Thinking

第一性原理思维

Thinking in Limits

极限思考法

Aspire to Be Less Wrong

追求少犯错

THE VALUE OF ENGINEERING

工程学的价值

Engineering Is Magic

工程即魔法

Engineering Wins Wars

工程决胜

Engineering Creates Value

工程创造价值

更多资源 https://mirrorsite.org

PART II: ULTRA HARDCORE WORK

第二部分：极限硬核工作

WHAT IT TAKES

成功之道

Take Responsibility

担当责任

Earn Deep Understanding

深入理解

Sleep on the Factory Floor

睡在工厂车间

Frontline Leadership

前线领导

Adversity Forges Strength

逆境淬炼力量

Eat Glass and Stare into the Abyss

直面深渊

BUILDING EXCEPTIONAL TEAMS

打造卓越团队

A Group with a Goal

目标导向型群体

更多资源 https://mirrorsite.org

Create a Culture of Builders

创建建设者文化

Recruit for Exceptional Ability

招募卓越能力者

Retain Only Special Forces

只留特种部队

Feedback over Feelings

结果重于感受

DESIGNING THE ORGANIZATION

组织设计

Remove Organizational Boundaries

消除组织壁垒

Simple Communication

简洁沟通

Innovation Needs Permission to Fail

创新需要允许失败

Simplicity Wins

简约制胜

The Algorithm

算法之道

MANIACAL URGENCY

极致紧迫感

更多资源 https://mirrorsite.org

Don’t Waste Time

切勿浪费时间

Speed Is Both Offense and Defense

速度即攻防兼备

Do Things in Parallel

并行推进事务

Break Down the “Impossible”

破解'不可能'

Set Aggressive Timelines

设定激进时间表

WE MUST MAKE STUFF

我们必须实干制造

The Real Work

实干为本

The Factory Is the Product

工厂即产品

Attack the Constraint

攻克瓶颈

Manufacturing Is the Moat

制造即护城河

更多资源 https://mirrorsite.org

PART III: BUILDING COMPANIES

第三部分: 企业建设

BECOMING A FOUNDER

成为创始人

Starting Zip2

创立Zip2公司

Going All In, Again (Zip2 Earnings into PayPal)

再次全力押注（Zip2收益投入PayPal）

Listen Well, Correct Fast

善听速改

Unite and Conquer

团结征服

From Exile to Exit

从放逐到退出

BUILDING TESLA

打造特斯拉

The Mission to Protect the Planet

守护地球的使命

Going All In, Again (PayPal Earnings into Tesla)

再次倾尽所有（PayPal收益注入特斯拉）

更多资源 https://mirrorsite.org

Building the First Prototype

首款原型车诞生

Becoming Tesla’s CEO

临危受命执掌特斯拉

Sequenced Strategy of Tesla

特斯拉阶梯式战略

Keeping Tesla Alive

特斯拉生死保卫战

The Edge of Sanity

理性边缘的徘徊

A Whole New Kind of Car Company

重构汽车产业范式

Give People More for Less

低成本高价值交付

The Battle of Public Perception

公众认知争夺战

Founding SolarCity

太阳城公司创立

BUILDING SPACEX

创建太空探索技术公司

The Only One Crazy Enough for Space

孤勇者的太空征程

I Expected to Lose Everything

我已准备全盘皆输

更多资源 https://mirrorsite.org

Rockets from First Principles

第一性原理造火箭

Keeping SpaceX Alive

太空探索技术公司存续之战

Landing NASA Contracts

斩获NASA航天合约

You Have to Blow Things Up

你必须颠覆旧事物

Building the Just Barely Possible

构建极限可能

Optimizing for Mass to Mars

为火星质量优化

更多资源 https://mirrorsite.org

PART IV: ON BEHALF OF HUMANITY

第四部分: 代表人类

BUILDING OUR FUTURE

建设我们的未来

Companies Are Philanthropy

企业即慈善

Companies Create Wealth for All

企业为全民创造财富

Companies to Start

待创企业

Companies Drive Progress

企业驱动进步

THE AGE OF ABUNDANCE

丰饶时代

The End of Scarcity

稀缺终结

Exponential Intelligence

指数级智能

Upgrading the Human Mind

升级人类思维

更多资源 https://mirrorsite.org

The Last Human Drivers

最后的人类驾驶员

Sustainable Abundance

可持续富足

OUR EXISTENTIAL RISKS

我们的生存风险

This Is the Best Time to Be Alive

这是最好的时代

World War III

第三次世界大战

Regulation Accumulation

监管堆积

Unsustainable Energy

不可持续能源

Misaligned Artificial Superintelligence

错位人工超级智能

Population Collapse

人口崩溃

Asteroids and Comets

小行星与彗星

BECOMING MULTIPLANETARY

成为多行星物种

更多资源 https://mirrorsite.org

Becoming Multiplanetary Is an Evolutionary-Scale Event

成为多行星物种是演化级事件

If You Love Life, Protect It

若热爱生命，则守护生命

The Gateway to Mars

通往火星之门

Building the New World

建造新世界

Colonizing the Galaxy

殖民银河系

BONUS

奖励

THE **69** CORE MUSK METHODS

马斯克核心方法**69**条

TIMELINE OF ELON MUSK

埃隆·马斯克年表

ELON'S RECOMMENDED READING

埃隆推荐书单

WANT MORE?

更多资源 https://mirrorsite.org

延伸阅读

APPRECIATION

致谢

ABOUT THE AUTHOR

关于作者

更多资源 https://mirrorsite.org

NOTES ON THIS BOOK

本书说明

This is a book of Elon’s ideas in his own words. I built this book entirely out of transcripts, tweets, and interviews over his entire life to date. The body of this book comes directly from him. On this, a few important points:
本书完全呈现埃隆·马斯克本人的思想原声全书内容完全基于他迄今所有的演讲实录、推文及访谈本书主体内容均直接源自马斯克本人，特此说明：

- Transcripts have been edited for clarity, brevity, and flow multiple times.
- 文本经过多次编校以确保清晰度、简洁性与流畅性
- Given potential for fakes, edits, and misquotes, I can’t be certain of every source’s authenticity.
- 鉴于存在伪造、篡改及误引风险，部分原始材料真实性无法完全确保
- Please verify phrasing with a primary source before citing Elon from this book.
- 在引述本书中埃隆的观点前，请务必通过原始来源核实措辞准确性。
- Please interpret generously.
- 请予以包容性解读。

Everything in this book is taken out of context. To create this book, I recontextualized ideas in an attempt to make them more accessible, useful, and memorable.

更多资源 https://mirrorsite.org

本书所有内容均脱离原始语境呈现。为编纂本书，我对原始理念进行了重新语境化处理，旨在提升其可理解性、实用性和记忆度。

As ideas passed through time, space, and medium, phrasing may have shifted in flight. Every effort was made to keep the original intent, but errors are possible. His original intent may be different from your interpretation in a different time, format, and context.

思想历经时空流转与媒介转换，表述方式可能已发生迁移。虽竭力保全原意，但可能存在误差。其本意可能与你在不同时空、形式和情境下的解读存在差异。

All brilliance in this book is Elon’s; any mistakes are mine.

书中智慧皆属埃隆；纰漏均为我责。

Highlights

重点标记

Highlights are used to summarize or punctuate an idea. You could flip through the book reading just these and find valuable ideas. Highlights are easy to spot because they look like this: 重点标记用于提炼核心观点或强化概念表达。仅翻阅标记内容即可获取宝贵洞见。标记易于识别，其呈现形式如下：

> I am a highlight.
>
> 此为重点标记示例。

Bolded Questions

加粗提问

更多资源 https://mirrorsite.org

Many excerpts are from interviews; some are written to provide proper context. The questions help create the feeling of an intimate dialogue between you and Elon.

多数节录源自访谈；部分补充文本旨在提供完整语境。提问设计旨在营造你与埃隆的亲密对话氛围。

Skip Around

自由跳读

Jump to anything that interests you and skip anything that doesn’t. This is a choose-your-own-adventure book, though some ideas build on previous examples.

跳转至任何你感兴趣的内容，略过不感兴趣的部分。这是一本选择-你自己-的-冒险之书，尽管部分观点建立在先前案例之上。

更多资源 https://mirrorsite.org

FOREWORD

前言

—BY NAVAL RAVIKANT

——纳瓦尔·拉维坎特

You’re holding in your hands the only book an entrepreneur needs. A lone founder takes a unique journey to discover and encapsulate the truth into a product. Weighted by responsibility and expectation, the founder seeks out mentors and books—but the best mentors can’t be hired, and the books are either anecdotal or academic. The only reliable teacher is bitter experience.

此刻你手中的这本书，是企业家唯一需要的指南。一位孤独的创始人踏上独特旅程，发掘真理并将其浓缩为产品精髓。肩负责任与期望的重担，创始人寻求导师与书籍——但顶尖导师无法雇佣，各类书籍又往往流于轶事或学术。唯一可靠的老师是惨痛的教训。

In this book, Eric put his ego aside and did the thankless work of compiling Elon’s best lessons, in Elon’s own words, as practical as possible. This isn’t a tedious biography or recounting of events, it’s the explanation and the manual. An eager co-founder stole my first copy, and my coworkers will get the next twenty.

本书中，埃里克放下自我，完成这项吃力不讨好的工作：以埃隆的原话尽可能务实地汇编其最佳经验。这不是一本冗长的传记或事件记

更多资源 https://mirrorsite.org

录，而是解释与手册。一位热切的联合-创始人偷走了我的初稿，而我的同事们将获得接下来的二十份。

Elon is the greatest entrepreneur since Steve Jobs, but he isn't just a copy. History doesn't repeat, but it does rhyme, and it's the occasional Napoleon, whether in science, art, or politics, who appears and reroutes the inexorable forces of history with a unique vision and drive. Hard work is common, intelligence uncommon, courage rare—and Elon combusts all three.

埃隆是自史蒂夫·乔布斯以来最伟大的企业家，但他绝非简单的复制品。历史不会重演，但总会押韵。在科学、艺术或政治领域，偶尔出现的拿破仑式人物，以其独特的远见和驱动力，扭转不可抗拒的历史洪流。勤奋常见，聪慧难得，勇气稀缺——而埃隆将三者熔铸于一身。

The banal observation is that he's a founder of Tesla, SpaceX, OpenAI, and Neuralink. These companies, however, are just means to products—the self-driving cars, the autonomous robots, the thinking machines, and the awe-inspiring, ground-shattering, heavy rockets that thunder into space and land on their toes. Even the products are just a means unto the mission. If it's allowed by the laws of physics, and takes us into our sci-fi dreams, Elon will drag us there.

平庸的认知仅限于他是特斯拉、太空探索技术公司、OpenAI 和Neuralink的创始人。但这些公司只是实现产品的载体——那些自动-驾驶汽车、自主机器人、思考机器，以及轰鸣升空、精准着陆的令人敬畏、撼动地基的重型火箭。即便产品本身，也只是实现使命的手段。只要符合物理学定律，且能带领我们抵达科幻-梦想之境，埃隆必将引领我们抵达那里。

The wealth, the fame, and the envy are a byproduct. Crabs in the gravity well, blinded by politics, will point to his father's and the government's money. But envy says more about the envious than the envied. Elon sleeps on the factory floor, doubles down every time, and never gives up. The people worth impressing are impressed, and millions of children are

更多资源 https://mirrorsite.org

inspired to make real change. Culture is downstream of the technology that enables us to be generous and free, and Elon will be remembered long after the big talkers and small doers are forgotten.

财富、名声与嫉妒不过是副产品。那些困于引力深井、被政治蒙蔽的螃蟹们，总会指向他父亲的财富与政府的资金。但嫉妒本身，更映照出嫉妒者的心态而非被妒者的本质。埃隆睡在工厂车间，每次危机都加倍投入且永不放弃。值得打动的人为之动容，数百万儿童因此立志创造真实变革。文化源于使我们慷慨自由的技术洪流，当夸夸其谈者与碌碌无为者被遗忘时，埃隆之名仍将长存。

As Chief Engineer, Elon reminds us that building value is building things, not financing or managing them. It’s a better world when the richest man is one who creates wealth, rather than shuffles it around, or seizes it in the name of the people.

作为首席工程师，埃隆提醒我们：创造价值在于构建实体，而非融资或管理。当世界首富是创造财富而非转移财富、或以人民之名攫取财富之人时，世界将更加美好。

Wealth, as the physicist David Deutsch wrote, is the set of physical transformations that we can effect—true for both individuals and societies. The main component of wealth is knowledge, not capital. By creating new knowledge, and then instantiating it in products that are duplicated and distributed, Elon and his fellow entrepreneurs are engines of wealth creation and distribution.

正如物理学家大卫·多伊奇所述，财富即我们所能实现的物理层面的改变——无论对个体还是社会皆然。财富的核心是知识而非资本。通过创造新知识并转化为可复制传播的产品，埃隆及其企业家群体已成为创造与分配财富的引擎。

You may have the opportunity to ask yourself: When humanity went to the stars, what were you doing? When men walked on Mars, were you mocking them or exhorting them? When they mined the first asteroids and built the first space stations? When fleets of self-driving cars reclaimed cities from

更多资源 https://mirrorsite.org

parking and traffic? When the paraplegics rose up and walked alongside us? When the robots took over the miserable and repetitive work? Were you in the front row, cheering? Or sour-faced in the bleachers, jeering?

你或许会自问：当人类迈向星际时，你在做什么？当人类踏足火星时，你在冷嘲热讽还是摇旗呐喊？当他们开采首批小行星并建造首座空间站时？当自动-驾驶车队重塑城市交通格局时？当瘫痪者起身与我们并肩行走时？当机器人接管了那些痛苦重复的工作时？你是在前排欢呼雀跃吗？还是在观众席上苦瓜着脸冷嘲热讽？

There is even a third option—young or old, your life isn't over yet. Elon's methods are copy-able, in matters big and small. Eric has laid them out for you as plainly as possible. If your motives are pure and greater than yourself, the world will conspire in its subtle ways to help you. When one man shows what's possible, a million arise, not as followers, but as missionaries in their own right.

还有第三种选择——无论老少，你的人生尚未落幕。埃隆的方法无论大小皆可复制。埃里克已为你清晰铺陈。若你动机纯粹且超越私利，世界将以微妙方式悄然助力。当有人证明可能性，百万使徒应运而生，非为追随者，实为自主的布道者。

You don't have to do what Elon does, and you don't have to do it his way, but this short life is best spent in the arena, on something other than the mundane and insatiable self. Reject the craving for comfort and social approval. Reorient to the optimism of youth. Leave those talking and dividing, and get on the path to learning and building.

不必效仿埃隆所为，亦无需遵循其道，但短暂生命当挥洒于竞技场，超越平庸与贪得无厌的自我。摒弃对安逸与社会认同的渴求，重拾青春期的乐观精神。远离空谈分裂之徒，投身学习创造之道。

Your energy is best spent with like-minded people who are unstoppable on a mission to make something beautiful. Don't make the thing to make the money, make the money so that you can make the thing. Don't get paid for work, get paid so that you can do your best work. Rise up, choose

更多资源 https://mirrorsite.org

inspiration over envy, and show your younger and older selves that the desires of this life were completely and totally exhausted into the universal will.

你的精力当倾注于志同道合者——那些为创造美好事物而永不停歇的使命驱动型人才。莫为牟利而造物，要筹资以成伟业。莫为薪酬而劳作，要取酬以臻卓越。奋起前行！择灵感弃嫉妒，向年少与年长的自己证明：此生抱负已全然熔铸于宇宙意志。

更多资源 https://mirrorsite.org

ERIC’S WELCOME TO THIS BOOK

埃里克致读者

Hello, and welcome!

您好，欢迎阅读！

I’m delighted you picked up this book. I’ve put thousands of hours into collecting, curating, and editing Elon’s most useful ideas for you.

感谢您选择本书。我投入数千小时精心编撰，为您凝练埃隆最具实践价值的思想精髓。

You may be seeking purpose, a mission worthy of your life’s effort. You might already have a clear purpose and seek the tools for success. You will find both in this book.

你可能在追寻人生目标，寻找值得毕生投入的使命。你可能已有明确目标，正在寻求成功的途径。这本书将为你提供两者。

Elon’s purpose is to help humanity survive and thrive. He thinks in sweeping timescales, like a sci-fi epic. By funding and leading SpaceX and Tesla, Elon Musk has done the entrepreneurial equivalent of running a two-minute mile. Twice. *At the same time*.

更多资源 https://mirrorsite.org

埃隆的使命是帮助人类存续与发展。他以宏大的时间尺度思考，如同科幻史诗。通过创立并领导太空探索技术公司与特斯拉，埃隆·马斯克完成了企业家领域的双重壮举——如同四分钟跑完一英里。同时完成。

Regardless of your industry, mission, or beliefs—there is something to learn from this feat.

无论你身处何种行业、秉持何种使命或信念——这项成就都值得借鉴。

After seeing what Elon and his teams have accomplished, we stand taller, and the universe seems smaller.

目睹埃隆及其团队的成就后，我们挺直了腰板，宇宙似乎也变得触手可及。

To me, Musk represents the idea that I am capable of more than I ever imagined. Even more importantly, he shows that together we are capable of the currently impossible.

对我而言，马斯克代表着这样的信念：我的潜力远超想象。更重要的是，他证明了人类齐心协力就能实现当下不可能完成之事。

He models our moral duty to grab the impossible and drag it into the possible through massive effort, ingenuity, and force of will. This is how we build an ever-better future.

他以身作则地诠释了我们的道义责任：以非凡努力、创新智慧和顽强意志，力挽狂澜地将不可能化为可能。这正是我们构建永续精进未来的途径。

In the past, the richest man on Earth was a monarch, oil heir, or financier. Now, the richest man on Earth is an engineer, entrepreneur, and American immigrant who has taken massive personal risks to build new things that

更多资源 https://mirrorsite.org

solve problems on a planetary—and interplanetary—scale. We are learning to respect the builders more than the rulers.

昔日地球首富非君王即石油大亨，抑或金融巨鳄。如今登顶财富之巅的，却是一位甘冒巨大个人风险的工程师、企业家、美国移民——他缔造的全新解决方案正在地球乃至星际尺度破解难题。我们正学会更敬重建设者而非统治者。

Elon Musk has joined a lineage of legendary entrepreneurs who transformed our culture. Henry Ford's greatest impact was creating car culture. Steve Jobs's greatest impact was on computer culture. Elon Musk's greatest impact will be advancing the culture of engineering, entrepreneurship, and adventure over the next century.

埃隆·马斯克已跻身重塑人类文明的传奇企业家行列。亨利·福特最伟大的成就是缔造了汽车文化。史蒂夫·乔布斯最深远的烙印在于重塑计算机文化。埃隆·马斯克划时代的贡献，将是推动工程学、企业家精神与冒险文化在未来百年深度融合。

Elon's energy, vision, and his team's achievements have stoked a fire in my chest. I feel *activated* to advance human prosperity, knowing that humans are a few years into an inspiring million-year journey of knowledge and construction. Working on this book gave me a new level of spiritual satisfaction and inspiration. You and I may be ants, but we are building an intergalactic cathedral.

埃隆的精力、远见及其团队的成就点燃了我胸中之火。我被激发去推动人类繁荣，深知人类正处在知识积累与文明建设的百万年壮阔征程的初期。创作本书让我获得了前所未有的精神满足与灵感启迪。你我或许如蝼蚁，但正在构筑一座星际大教堂。

I want you to stare down the biggest problems humanity faces and attack them with furious ingenuity. If the next generation has one million Musks, our grandchildren will flourish beyond our wildest dreams.

更多资源 https://mirrorsite.org

我要你们直面人类最严峻的挑战，用狂热的创造力攻克它们。若下一代涌现百万个马斯克，我们的子孙将繁荣昌盛远超想象。

One million Musks. That’s my dream for this book.

一百万个马斯克——这正是我对此书的愿景。

Seeing life-changing ideas dissolve into the algorithms breaks my heart. I build these books to rescue knowledge and preserve it in our most proven, permanent format.

目睹改变人生的洞见在算法中消解，令我痛彻心扉。我编纂这些书籍旨在拯救知识，并以最可靠、最恒久的载体形式将其传承。

When I create books, I focus on making them as useful as possible. No fluff, no filler. I hope you have a highlight on every single page.

创作书籍时，我专注最大化其实用价值。杜绝冗余修饰，剔除无效填充。愿每一页都闪耀令你心动的思想火花。

As you read, imagine you are out to dinner with Elon Musk. You’re deep in conversation as he shares stories and ideas you can apply in your own life and work. I hope you feel personally tutored by the greatest living entrepreneur.

阅读时，请沉浸于与埃隆·马斯克的晚餐对话。当他分享那些可赋能你事业与人生的洞见时，你们正在进行深度思想碰撞。愿你切身感受这位当代最卓越企业家的言传身教。

I focus entirely on Elon’s most useful ideas. We spend zero pages on Elon’s family life or politics. This is not a biography or a gossip column. My books are about sharing timeless ideas that work.

我完全聚焦于埃隆最具实践价值的核心思想。全书未着墨于马斯克的私人生活或政见立场。本书非人物传记，亦非八卦谈资。我的著作致力于传播历久弥新的实践智慧。

更多资源 https://mirrorsite.org

This book has four parts:

全书架构分为四大部件：

1. **Pursue Purpose:** The foundations of a unique life
1. **追寻目标：**构筑独特人生的根基
2. **Ultra Hardcore Work:** Mindsets and principles for achieving the barely possible
3. **极限硬核工作：**突破不可能成就的思维体系与行动准则
4. **Building Companies:** Stories and strategies from PayPal, Tesla, and SpaceX
5. **企业建设：**PayPal、特斯拉与太空探索技术公司的战略实践
6. **On Behalf of Humanity:** How you can be part of elevating the future of humanity
7. **代表人类：**如何参与提升人类未来的伟大事业

The first half is filled with principles and tactics Elon uses to guide his life and build his companies. I guarantee you will get valuable ideas in the first few pages.

上半部分阐述了埃隆用以指导人生和创建企业的原则与策略。我保证你在前几页就能获得宝贵洞见。

The second half has more stories. They share Elon’s adventures and how he applied his principles to choose worthy missions and built SpaceX and Tesla. We finish with Elon’s view of the years ahead and how you can make an impact.

下半部分包含更多故事篇章。它们讲述埃隆的探索历程，展示他如何运用原则选择崇高使命，并创建太空探索技术公司和特斯拉。最后以埃隆对未来的展望收尾，揭示你也能产生影响的方式。

When you’re done reading (maybe a few times!), I hope you enact more of Elon’s hardcore work ethic, boundless optimism, and unabashed courage.

更多资源 https://mirrorsite.org

当你读完本书（或许不止一遍！），愿你践行更多埃隆的极致工作伦理、无限乐观精神与无畏勇气。

If this book resonates with you, know that we're fast friends. You're joining a global community of allies in pushing progress. I'd love to hear from you and hope you will help us spread these ideas far and wide. Let's leave humanity better than we found it.

若此书引发共鸣，我们便是知交挚友。你将加入推动进步的全球盟友社群。我期待你的反馈，并希望你助力传播这些思想至更广阔的天地。让我们共同缔造更美好的人类未来。

Forward. Together.

向前。同心协力。

Eric

埃里克

更多资源 https://mirrorsite.org

“All of physics is either impossible or trivial. It is impossible until you understand it, and then it becomes trivial.”

“所有物理学要么不可能，要么微不足道。在理解之前它是不可能的，理解之后就变得微不足道。”

—ERNEST RUTHERFORD[1]

——欧内斯特·卢瑟福[1]

1 Elon Musk (@elonmusk), X (formerly Twitter) account, https://x.com/elonmusk.

1 埃隆·马斯克 (@elonmusk)，X（原推特）账号，https://x.com/elonmusk

更多资源 https://mirrorsite.org

Now, here is Elon in his own words…

现在，以下是埃隆本人的原话……

更多资源 https://mirrorsite.org

PART I

第一部分

更多资源 https://mirrorsite.org

PURSUE PURPOSE

追寻目标

I don’t mind if my legacy is accurate or inaccurate, as long as I die feeling I’ve done the right thing for the future of Consciousness.[2]

我不在意我的遗产是否被准确记录，只要临终时确信自己为意识体的未来做出了正确抉择。[2]

2 “Elon Musk: ‘10X Every 6 Months,” Farzad, April 8, 2024, YouTube video, 32:28, https://www.youtube.com/watch?v=FPpPTp7FIHY.

2 《埃隆·马斯克："每6个月实现十倍增长"》，Farzad，2024年4月8日，YouTube视频，32:28，https://www.youtube.com/watch?v=FPpPTp7FIHY

更多资源 https://mirrorsite.org

LIVING A PURPOSEFUL LIFE

活出意义人生

You can choose to be not ordinary.

你可以选择不再平凡

You can choose not to conform to the conventions taught by your parents.

你可以拒绝墨守父母教导的常规

It’s possible for ordinary people to choose to be extraordinary.[3]

普通人也能选择成为非凡者[3]

更多资源 https://mirrorsite.org

BE USEFUL

创造价值

> Don’t aspire to glory; aspire to work.[4]
>
> 莫求虚名，但求实干[4]

The measure of success in my life is: “How many useful things can I get done?”

我衡量人生的成功标准是：'我能完成多少有用的事？'

On a day-to-day basis, I wake up in the morning and ask, “How can I be useful today?”

在日常工作中，我清晨醒来便会自问：‘今天我能发挥什么作用？’

I want to maximize my utility. It’s difficult to be useful at scale.[5]

我追求实用工具价值的最大化。实现规模化实用价值颇具挑战性。[5]

I can’t always get it right, but I aspire to make our future good. Sometimes I make mistakes. But, I try to take the set of actions most likely to improve the probability that the future will be good.[6]

虽无法尽善尽美，但我矢志创造美好未来。失误在所难免。但我始终选择最有可能提升未来向好概率的行动组合。[6]

Try to be useful. Do useful things for your fellow human beings and the world. It’s hard to be useful, to contribute more than you consume. Can you

更多资源 https://mirrorsite.org

have a positive net contribution to society? Aim for that.[7]

竭力创造实用价值。为人类同胞与世界贡献实用价值。实现实用价值实属不易，需确保贡献远超消耗。能否对社会产生净正向贡献？此乃应追求之目标。[7]

I have a lot of respect for someone who puts in an honest day's work to do useful things. I admire anyone making a positive contribution to humanity. Whether that is in farming, technology, entertainment, or whatever else. To anyone useful to the rest of humanity: I admire you greatly.[8]

我敬重那些日复一日踏实创造实用价值之人。凡为人类作出积极贡献者，皆令我钦佩。无论是在农业、技术、娱乐还是其他领域。致所有对人类有用的人：我深深敬佩你们。[8]

Q: How do you know if you're helping?

问：如何判断自己是否在提供帮助？

I think about it mathematically. How many people you helped, multiplied by how much help you provided each person, on average. How many people you helped, and how much—that's the total utility (usefulness).[9] It's almost like the physics definition of true work. If you aspire to do true work, your probability of success is much higher.[10]

I think about it mathematically. How many people you helped, multiplied by how much help you provided each person, on average. How many people you helped, and how much—that's the total utility (usefulness). | 我会用数学思维来思考这个问题。你帮助的人数，乘以你为每个人提供的平均帮助程度。你帮助的人数及其帮助程度——这就是总效用（实用价值）。[9] 这几乎等同于物理学中对真功的定义。若你立志完成真功，成功的概率将大幅提升。[10]

For any product you're trying to create, ask yourself the utility improvement compared to the current state of the art, multiplied by how

更多资源 https://mirrorsite.org

many people it would affect.

对于任何待创造的产品，需自问：相比当前技术水平，其效用提升程度乘以将影响的人数规模。

Building something that makes a big difference to a small number of people is just as great as something that makes a small difference for a vast number of people. Mathematically, the total positive impact would be roughly similar for those two things. It's about trying to be useful.[11]

为少数人带来重大改变，与为多数人带来微小改善，两者同样伟大。从数学角度看，这两类事物的总体积极影响大致相当。关键在于努力成为有用之人。[11]

This is the mathematical first principles perspective—utility and numbers. Is some simple app really making people's lives better? If it's affecting a lot of people positively, even in a small way, then yes, that is good.[12]

这是基于数学第一性原理的视角——实用价值与量化分析。某个简单的应用程序真的在改善人们的生活吗？若能对大量人群产生积极影响，即便程度有限，也值得肯定。[12]

Not every product needs to change the world. Many people do lots of useful things. Just ask yourself, is what I'm doing as useful as it could be? The goal of an organization should be usefulness to society. Not every product will change the world, but if it's making people's lives better, that's great.[13]

并非所有产品都需要改变世界。许多人都在从事有价值的工作。只需自问：当前工作是否实现了最大价值？组织的核心目标应是创造社会价值。虽非每款产品都能改变世界，但只要改善人们生活便是成功。[13]

This is the same advice I give to my own children: "Follow your heart in terms of what you find interesting or fulfilling to do."[14] I hope they will work extremely hard and become productive contributors to society. I'm

更多资源 https://mirrorsite.org

also hopeful they will do things like engineering, writing books, or just in some way, adding more than they take from the world.[15]

This is the same advice I give to my own children: “Follow your heart in terms of what you find interesting or fulfilling to do.” | 我给子女的忠告也是如此："追随内心，选择你感兴趣且能获得成就感的事业。"[14] 期望他们极度勤奋，成为对社会有实质贡献的人。更希望他们投身工程学、著书立说等领域，以任何方式实现价值净输出。[15]

> A useful life is worth having lived.[16]
>
> 创造价值的人生才值得活过。[16]

更多资源 https://mirrorsite.org

FIGHT FOR THE FUTURE

为未来而战

> Fight for the things that make you excited about the future.
>
> 为那些令你对未来心潮澎湃的事物而奋斗。
>
> The future will not get here fast enough unless we force it.[17]
>
> 除非我们主动推动，否则未来不会以足够快的速度到来。[17]

I want to make sure there is a good future for humanity. We're on a path to understanding the nature of the universe, the meaning of life. Why are we here; how did we get here?

我致力于确保人类拥有美好的未来。我们正走在理解宇宙本质与生命意义的道路上：人类为何存在？如何抵达此处？

I came to the conclusion that if we can advance the knowledge of the world—if we can do things that expand the scope and scale of consciousness—then we're better able to ask the right questions and become more enlightened. That's the only way forward.

我得出一个结论：若能推动世界知识的进步——若能拓展意识的范围与规模——我们就能更好地提出正确问题，获得更高层次的觉悟。此乃唯一前行之道。

更多资源 https://mirrorsite.org

I use scale *and* scope because we benefit from more consciousness *and* more variety in consciousness. If everyone is thinking about exactly the same things the same way, that may not create new knowledge.[18] I'm motivated by curiosity more than anything.[19]

I use scale *and* scope because we benefit from more consciousness *and* more variety in consciousness. If everyone is thinking about exactly the same things the same way, that may not create new knowledge. | 我强调规模与范围，是因为意识总量的增长及多样性的提升能造福人类。若众人以完全相同的模式思考完全相同的事物，新知识恐难诞生。[18] 驱策我前行的首要动力，莫过于好奇心。[19]

> I almost had an existential crisis trying to figure out "What does it all mean? What's the purpose of things?"
>
> 在探寻'生命真谛'的过程中，我几乎陷入存在主义危机。事物的意义何在？

In college, I would wonder about the future and what areas were really going to have an important impact on the future of humanity as a whole. This wasn't for a paper, just what I thought about in the shower. I came up with five areas.[20]

大学时期，我常常思考未来，思考哪些领域将对人类整体未来产生重大影响。这不是为了写论文，只是我在淋浴时的思考。我归纳出了五个领域。[20]

The three areas I thought would have the biggest *positive* impact on the future of humanity were the internet, the transition to sustainable energy, and space exploration—in particular the extension of life to multiple planets.[21]

更多资源 https://mirrorsite.org

我认为将对人类未来产生最积极影响的三大领域是互联网、向可持续能源转型以及太空探索——尤其是将生命扩展到多个星球。[21]

The other two, artificial intelligence and rewriting genetics, were a little more uncertain in terms of net benefit. They could be a double-edged sword, and we're not sure which edge is the worst.[22]

另外两个领域——人工智能和基因重组，在净效益方面则更具不确定性。它们可能是把双刃剑，而我们尚不确定哪面刀刃更危险。[22]

I didn't ever expect to be involved in space exploration and expansion, but it seemed important to me even then. Eventually, with the capital from selling PayPal, I was able to work on all three.[23]

我从未想过会涉足太空探索与扩张领域，但即便在当时，这对我而言似乎至关重要。最终，通过出售PayPal获得的资金，我得以同时开展这三项事业。[23]

Q: What would you say is your most core skill?

问：您认为自己最核心的能力是什么？

> I don't worship anything, but I devote myself to the advancement of humanity using technology.
>
> 我不崇拜任何事物，但致力于运用技术推动人类进步。

My core personal competence is technology. If something has to be designed or invented and you must ensure the value of the thing you create is greater than the cost of the inputs—that's my core skill.[24]

我的核心个人能力在于技术领域。当某物需要设计或创造时，必须确保其价值高于投入成本——这正是我的核心能力所在。[24]

更多资源 https://mirrorsite.org

I look at the future from the standpoint of probabilities. It's a branching stream of probabilities, and actions we can take now affect those probabilities: Accelerate something, slow down another thing, or maybe introduce something new.[25]

我以概率视角审视未来。未来是分支状的概率流，而我们当下的行动能改变这些概率：加速某些进程，延缓另一些发展，或引入全新变量。[25]

You have to ask, What are we doing to move toward the paths likely to make for a good future? That is what I care about. We're all projecting out to the future in some way, and if you think we're going to end up in some terrible situation, that's depressing.[26]

必须思考：我们正在采取哪些行动，才能迈向通往美好未来的可能路径？这才是我真正关心的。我们都在以某种方式展望未来，若你认为结局注定悲惨，那将令人沮丧。[26]

I'm interested in affecting the future in positive ways. I want to build wondrous new technologies where you feel awe when you see it: "How does that even happen? How is that possible?"[27]

我关注的是如何积极影响未来走向。我想开发神奇的新技术，让人们看到时心生敬畏：「这怎么可能发生？这怎么可能实现？」[27]

I'm not trying to be some sort of savior; that's not my goal. The importance of these things just seems obvious to me. If it seems like the obvious thing to do, I'm not sure why you would do anything else. We want to maximize the happiness of our population, propagate into the future as far as possible, and understand the nature of reality. Everything else follows from that.[28]

我并非想当什么救世主；这不是我的目标。只是这些事的重要性在我看来不言而喻。如果某件事显而易见该做，我不理解为什么还要选择其他。我们要最大化人类福祉，尽可能将文明延续到未来，并理解现实本质。其余一切都由此衍生。[28]

更多资源 https://mirrorsite.org

> Remember the future.[29]
>
> 铭记未来。[29]

更多资源 https://mirrorsite.org

OBSESS FOR SUCCESS

痴迷于成功

> Doing something I enjoy, which is useful for other people—that gives me satisfaction.[30]
>
> 做自己热爱且对他人有用的事——这让我获得满足感。[30]

I didn’t aspire to create companies as a kid. I just liked computers. Don’t start a company because you want to be an entrepreneur or because you want to make money. It is better to approach from this angle: What is a useful thing you could build that you wish existed in the world?[31]

儿时我并未立志创办公司，只是单纯痴迷计算机。不要为了成为企业家或追求财富而创业。更好的切入角度是：世界上有哪些你希望存在且值得创造的有用事物？[31]

I do not start companies from the standpoint of asking, “What’s the best risk-adjusted rate of return?” or what I think could be successful. I just find things that need to happen, and try to make them happen. I thought these things needed to get done. If the money was lost, okay. It was still worth trying.[32]

我创办公司时从不以'什么是风险调整后的最佳回报率'作为出发点，也不考虑自认为可能成功的项目。我只专注于发现需要实现的事情，并全力推动其成真。我认为这些事业必须完成。即便资金亏损，也无妨。尝试本身仍具重大价值。[32]

更多资源 https://mirrorsite.org

Try to find an overlap of your talents and what you're interested in. You may have skill in something but don't like doing it. Try to find work that is a good combination of things you are inherently good at but also like doing.[33]

寻找天赋与兴趣的交集。你可能具备某项技能却厌恶执行。应选择既能发挥先天优势又契合个人志趣的工作组合。[33]

Then, try to get other people to work with you to create that thing. Keep making it better and better. If you create something useful, money will be the result. That's the way a properly working economy rewards the creation of useful goods and services.[34]

继而努力组建团队共同实现目标。持续进行精益优化。创造真正有价值的产品，财富自会随之而来。这正是健康经济体对创造实用商品和服务的回报机制。[34]

Successful entrepreneurs come in all sizes, shapes, and flavors. I'm not sure there's any one particular trait that makes them. However, if there is one to focus on, it would be to have an obsessive nature about the quality of the product. In this context, being obsessive-compulsive is a good thing.[35]

成功企业家群体形形色色，各具特色。我不确定是否存在某种特定的特质能造就成功。但如果必须聚焦一点，那就是要对产品质量保持近乎偏执的追求。在此情境下，痴迷-强迫特质反而是优势。[35]

Given that, really really, really liking what you do is a big advantage. It's important to like whatever you're doing. Life is too short to spend it doing something you don't like.[36]

正因如此，真正热爱所做之事是巨大优势。保持对所从事工作的热忱至关重要。人生苦短，不该浪费在厌恶之事上。[36]

If you like what you're doing, you think about it even when you're not working. It's something your mind is drawn to. If you don't like it, it's much harder to make yourself work.[37]

更多资源 https://mirrorsite.org

若真心热爱，即便非工作时间你仍会持续思考。这是思维不由自主的吸引力。若缺乏热爱，自我驱动将异常艰难。[37]

If you're creating something you love and think other people will love, it's much easier to sacrifice the time and effort. If it doesn't work out, you won't regret it.[38]

当创造自己喜爱且相信他人也会喜爱的事物时，时间与心血的付出便不再艰难。即便最终未成，你也绝不会后悔。[38]

> My way of dealing with mental problems is to make sure you really care about what you're doing—and take the pain.[39]
>
> 我应对心理问题的方式，是确保你真正热爱所从事的事业——并甘愿承受煎熬。[39]

更多资源 https://mirrorsite.org

START BEFORE THE WORLD IS READY

在世界准备好之前出发

> We say the things we believe, even when sometimes those things we believe are delusional.[40]
>
> 我们坚持自己笃信的信念，即便有时这些信念会被视为痴心妄想。[40]

When you're building a radically new product, people don't know they want it yet, because it's just not in their scope. Around 1946–1948, when they first started making TVs, they did a famous nationwide survey: "Will you ever buy a TV?" and around 96 percent of respondents said, "No."[41]

当你创造颠覆性新产品时，人们尚未意识到自己需要它，因为这完全超出了他们的认知范畴。1946年至1948年间电视机首次量产时，一项全国性调查显示：约96%受访者声称'永远不会购买电视'。[41]

> In the beginning of Tesla, no one told us they wanted an electric car…I heard that zero times.[42]
>
> 特斯拉初创时期，无人表示需要电动车……这种需求反馈我收到过零次。[42]
>
> If you need encouragement, don't start a company.[43]

更多资源 https://mirrorsite.org

> 若需他人激励，就别创业。[43]

Getting people to believe in you and what you’re doing is important. In the beginning, very few people will believe in you or what you’re doing. Over time, as you make progress, evidence will build. More and more people will start to believe.

让他人相信你和你的事业至关重要。最初阶段，极少有人会相信你或你的事业。随时间推移，当你取得进展时，证据会不断累积。越来越多人将开始认同这一观点。

更多资源 https://mirrorsite.org

CREATE MORE THAN YOU CONSUME

创造大于消耗

> Examine your beliefs of the economy.
>
> 重新审视你对经济的根本认知。

The economy is a positive-sum game, a “grow the pie” situation. Those who assume the economy is zero-sum believe the only way to get ahead is by taking things from another.

经济本质是正-和博弈，属于'做大蛋糕'的发展模式。持零-和博弈观者认为，成功只能通过资源掠夺实现。

But obviously the economy today is much, much greater than it was in the past. The economic output per person is massively greater than the past. Obviously the pie has grown, and grown much faster than the population has grown.[44]

但显而易见，当今经济体量已呈几何级超越。人均经济产出较历史水平实现跨越式增长。经济蛋糕不仅持续扩大，其增速更远超人口增长率。[44]

> I put a lot of stock in having a grow-the-pie mindset, not a zero-sum mindset.[45]
>
> 我高度推崇做大-蛋糕的思维模式，坚决摒弃零-和博弈思维。[45]

更多资源 https://mirrorsite.org

When I see people (even some smart people) with a bad attitude or doing things that seem morally questionable, it's often because they have a zero-sum mindset.

当我看到态度恶劣或行为有违道德的人（即使有些聪明人），这往往源于他们的零和思维。

They don't realize they have a zero-sum mindset, or at least don't realize it consciously. Those who have a zero-sum mindset believe the only way to get ahead is by taking things from others. Those who believe the pie is fixed believe the only way to have more pie is to take someone else's pie. This is obviously false.[46]

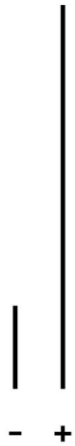
他们没有意识到自己持有零和思维，至少没有主动意识到这一点。持零和思维者认为，前进的唯一途径是从他人处夺取资源。认为蛋糕固定大小的人相信，获得更多蛋糕的唯一方式就是夺取他人的份额。这显然是错误的。[46]

In reality, there's a lot of pie. The economic pie is not fixed. It has grown dramatically over time. Make sure you're not operating from a zero-sum mindset, especially without realizing it. It will result in you trying to take things from others, which is not good. It won't benefit you.

现实中存在大量蛋糕。经济蛋糕并非固定不变。它随时间推移已显著扩大。务必避免在零和思维下行事，尤其在自己意识不到的情况下。这将导致你试图掠夺他人，此非善举。这不会让你受益。

> It's much better to work on adding to the economic pie. Create more than you consume.[47]
>
> 更好的做法是致力于做大经济蛋糕。创造的价值应远超消耗。[47]

更多资源 https://mirrorsite.org



创造多于消耗。

更多资源 https://mirrorsite.org

WORK LIKE HELL

拼命工作

> I am wired for war.[48]
>
> 我生而为战。[48]

Q: Why doesn't the world have more Elon Musks?

问：为何世上没有更多埃隆·马斯克？

If you think you want to be me or do the things I've done…I would say you're probably mistaken. Long periods of my life have been very painful and difficult. I'm not sure people would want to go through that.[49]

若你渴望成为我或复制我的成就...恕我直言，这恐怕是个错误。我人生中漫长的岁月充满痛苦与艰辛。我不确定有人愿意经历这些。[49]

The amount I torture myself is next level.[50] You need to have some kind of rage demon in your skull that drives you.[51]

The amount I torture myself is next level. | 我施加于自身的折磨程度堪称极致。[50] 你骨子里需蛰伏着驱策你的愤怒恶魔。[51]

Q: Are you always working?

问：你总在工作吗？

How many days a year do I not put in some meaningful amount of work? Maybe two or three.[52]

更多资源 https://mirrorsite.org

我全年真正休息的日子？或许仅两三天。[52]

You must be extremely tenacious. Work like hell. You have to put in eighty- to one-hundred-hour weeks every week. This will improve your odds of success.[53]

你必须极其坚韧，拼命工作。每周必须投入八十至一百小时的工作量。这将提高你的成功概率。[53]

You need to work. Work hard. Like every waking hour. Particularly if you're starting a company, you need to work super hard. Do the simple math: Somebody else is working fifty hours a week and you're working one hundred. You'll get twice as much done in a year.[54] If other people are putting in forty-hour workweeks and you're putting in one hundred, what takes them a year, you will achieve in four months.[55]

You need to work. Work hard. Like every waking hour. Particularly if you're starting a company, you need to work super hard. Do the simple math: Somebody else is working fifty hours a week and you're working one hundred. You'll get twice as much done in a year. | 你必须工作。全力以赴。把握每个清醒时刻。尤其在创业阶段，你需要付出超常努力。简单计算：别人每周工作五十小时，而你工作一百小时。一年内你将完成双倍的工作量。[54] 当他人投入四十小时周工时，你投入一百小时，他们耗时一年的任务，你四个月就能达成。[55]

You're not going to create revolutionary cars or rockets in forty hours a week. It just won't work. Colonizing Mars isn't going to happen on forty hours a week.[56]

每周四十小时不可能造出革命性的汽车或火箭。这行不通。每周四十小时无法实现火星殖民。[56]

> Nobody ever changed the world on forty hours a week.[57]

更多资源 https://mirrorsite.org

> 无人能凭四十小时周工时改变世界。[57]

I've done these things because I felt a strong compulsion to do them.[58] I've been burning the candle at both ends with a flamethrower for a very long time.

I've done these things because I felt a strong compulsion to do them. | 我坚持这些事，源于内心强烈的驱动力。[58] 长久以来，我始终以喷火器般的强度昼夜不息地工作。

From 2007 until 2022 was nonstop pain. There was a gun to my head to make Tesla work. Pull a rabbit out of your hat, then pull another rabbit. A stream of rabbits flying through the air. If the next rabbit does not come out, you're dead. It took a toll.

2007至2022年间持续承受着无休止的煎熬。当时犹如枪顶头颅般被迫确保特斯拉成功。先帽中取兔，继而再取一兔。空中接连飞出的兔子戏法。若下一只未能及时出现，便是死局。这般重压终致身心俱损。

You can't be in a constant fight for survival, always in adrenaline mode, and not have it hurt you. Fighting to survive keeps you going for quite a while.[59]

人不可能长期处于生死存亡的战斗状态，持续保持肾上腺素激增模式而不受损害。生存斗争确能驱动你坚持许久。[59]

With that said, I would say this to twenty-something me: I think there's some merit to not being too intense, and enjoying the moment a bit. Occasionally stopping to smell the roses would probably be a good idea.[60]

尽管如此，我想告诫二十来岁的自己：适度松弛、享受当下确有价值。偶尔驻足细嗅玫瑰芬芳不失为明智之举。[60]

更多资源 https://mirrorsite.org

When we were developing the Falcon One rocket on the Kwajalein Atoll, this beautiful little island in the middle of the Pacific, not once during that entire time did I pause and have a drink on the beach. Now, I realize I should have had a drink with the team on the beach…that would have been fine.[61]

在太平洋腹地秀美的夸贾林环礁研制猎鹰一号火箭期间，我从未暂停片刻于海滩小酌怡情。现在想来，我本应该和团队在海滩上喝一杯的……那样也挺好。[61]

> If heat death will inevitably end the universe, it actually **is** all about the journey.[62]
>
> 如果热寂终将让宇宙消亡，那么本质上**就是**重在旅程。[62]

更多资源 https://mirrorsite.org

FEEL THE FEAR; DO IT ANYWAY

感受恐惧；勇往直前

> Look fear straight in the eye and it will disappear.
>
> 直视恐惧，它自会消散。
>
> The nature of fear is that people don’t look at it.
>
> 恐惧的本质在于人们不愿正视它。
>
> Look at it directly and it will be gone.[63]
>
> 直面恐惧，它便不复存在。[63]

Q: How do you think about making a decision when everyone tells you it is a crazy idea?

问：当所有人都说这是个疯狂想法时，您如何决策？

First of all, I feel fear. It’s not as though I have the absence of fear. I feel it quite strongly. But when something is important enough and you believe in it enough, you do it in spite of fear.

首先，我会感到恐惧。我并非毫无畏惧。恐惧感相当强烈。但当事情足够重要且信念足够坚定时，纵有恐惧亦当力行。

更多资源 https://mirrorsite.org

You shouldn’t think, “I feel fear about this and therefore I shouldn’t do it.” It’s normal to feel fear. If you don’t feel fear, you definitely have something mentally wrong. Just feel it and let the importance of your mission drive you to do it anyway.

切勿因恐惧而却步。心存畏惧实属正常。若无恐惧，心理必有异常。全心感受它，让你使命的重要性驱动你无论如何都要完成它。

I also think fatalism is helpful to some degree. If you accept the true probabilities, it diminishes fear. When starting SpaceX, I thought the odds of success were less than 10 percent and I accepted I would probably lose everything. But maybe we would make some progress. If we could just move the ball forward—even if we died—maybe some other company could pick it up and keep moving and our work would still have done good.[64]

我也认为宿命论在某种程度上是有帮助的。若接受真实的概率，恐惧就会减弱。创立太空探索技术公司时，我认为成功概率不足10%，并接受可能会失去一切。但或许我们能取得一些进展。只要能推动事业前进——即便我们倒下——或许其他公司能接续前行，我们的工作仍将产生价值。[64]

We should not be afraid of doing something just because some amount of tragedy is likely to occur.

我们不应因可能发生的悲剧性事件而畏惧行动。

If our forefathers had taken that approach, the United States wouldn’t exist.[65]

若先辈们采取这种态度，美国就不会存在。[65]

更多资源 https://mirrorsite.org

Q: How do you persevere through these hard challenges? Where do you find the strength?

问：你如何在这些艰难挑战中坚持？你从何处获得动力？

That’s not how I think. I think: “This is simply something important. It must get done. We will keep doing it or die trying.” I don’t need a source of strength for that. Quitting is not in my nature. I don’t care about optimism or pessimism. Fuck that. We’re going to get it done.[66]

这不是我的思维方式。我认为：'此事至关重要，必须完成。我们将持续推进，誓死达成。'为此我不需要力量源泉。放弃不是我的本性。我不在乎乐观或悲观。都滚一边去。我们必将达成目标。[66]

I definitely emboldened over time.[67]

随着时间推移，我确实愈发果敢。[67]

更多资源 https://mirrorsite.org

SEEK THE NATURE OF THE UNIVERSE

探寻宇宙本质

> I don’t know the meaning of life. I don’t think we can answer that question well…**yet**.[68]
>
> 我不知道生命的意义何在。我认为目前我们尚无法完美解答这个问题……**但终将可以**。[68]

We must expand humanity and consciousness to the point where we *are* able to answer that question.[69]

我们必须将人类文明与意识拓展到能够真正解答这个问题的境界。[69]

It may be uncomfortable for a lot of people, but I think this is a rational and logical philosophy. Basically saying, “We don’t know what the answer is, but let’s try to find out.”[70]

这或许令许多人感到不适，但我认为这是理性且符合逻辑的哲学观。本质上是宣告：“我们虽不知答案为何，但必将全力探索。”[70]

I think we as humans collectively know part of the answer, but only a tiny part at this point. If we can make civilization last for a million years, we will probably know much more of the answer.[71]

我认为人类整体仅掌握着答案的片段，且目前所知甚微。若能使文明延续百万年，我们必将获得更接近真相的答案。[71]

If we date civilization from the first written language, it was about five thousand years ago. This is practically no time at all. If civilization were to

更多资源 https://mirrorsite.org

last a million more years, we're barely even at the beginning. Future humans will think of us as ancient ancients, like cavemen.[72]

若从第一种文字诞生算起，文明至今仅约五千年。这在时间长河中不过弹指一瞬。倘若文明能延续百万年，我们此刻不过刚刚起步。未来人类回望我们，将如同我们看待穴居人那般遥远。[72]

> This is the foundation of my philosophy: I am curious about the nature of the universe.
>
> 这构成了我的哲学根基：我对宇宙本质怀有永恒好奇。

We can see the archaeological evidence in the fossil record, based on what we know of physics, how we came to be at this point on Earth step by step. But that doesn't explain how the universe came to exist in the first place.[73]

基于物理学原理，我们通过化石记录的考古证据，逐步还原了人类在地球的演进轨迹。但这仍未解答宇宙最初的起源之谜。[73]

How do a bunch of molecules develop consciousness and feelings? From a physics standpoint, the chain of events from the beginning of the universe to now is quite well understood. There was a bunch of hydrogen gas that turned into complex molecules and now an assemblage of complex molecules—us humans who can feel, talk, and think. Apparently if you leave enough hydrogen gas sitting around long enough, it starts talking to itself. That's basically what happened here.[74]

为何分子集合能催生意识与情感？从物理学视角看，宇宙起源至今的事件链已相当明晰。氢气聚变形成复杂分子，最终诞生了能感知、交流、思考的复杂分子集合体——人类。显然，只要给予氢气足够时间，它终将开始自言自语。这基本上就是当时的情况。[74]

更多资源 https://mirrorsite.org

Assuming you believe the physics, which appear to be true, the universe started off as quarks and electrons and quickly became hydrogen, helium, lithium, most of the periodic table. Mostly hydrogen, though. Then, over a long period of time—13.8 billion years—that hydrogen became sentient.[75]

如果你相信物理学定律——它们似乎确实成立——那么宇宙始于夸克和电子，迅速形成了氢、氦、锂，以及元素周期表上的大部分元素。不过主要还是氢元素。随后在漫长的时间里——138亿年——这些氢元素演化出了意识。[75]

Where along the path from a bunch of hydrogen to human beings did consciousness start? It's crazy.[76] I wonder, is everything conscious or is nothing conscious? Maybe it's just degrees of consciousness or concentrations of consciousness.[77]

Where along the path from a bunch of hydrogen to human beings did consciousness start? It's crazy. | 从一堆氢元素到人类的进化过程中，意识究竟始于何处？这简直疯狂。[76] 我在想：一切皆有意识？还是皆无意识？也许只是意识的程度差异或浓度差异。[77]

Total collective consciousness is how many people there are times the average amount of consciousness per person. If we can expand consciousness by creating more humans and more digital intelligence, then our opportunity to understand the meaning of life is that much greater. I would call this the philosophy of curiosity—to better understand the nature of reality.[78]

集体意识总量等于人口总数乘以人均平均意识量。若通过创造更多人类和数字智能来拓展意识，我们就能有更多机会理解生命的意义。我称之为'好奇心哲学'——旨在更深入地理解现实的本质。[78]

What I think Douglas Adams was saying in his book *The Hitchhiker's Guide to the Galaxy* is "The universe is the answer." We need to figure out what questions to ask about the answer that is the universe. The question is the hard part, and if we can properly frame the question then the answer, relatively speaking, is easy.

更多资源 https://mirrorsite.org

我认为道格拉斯·亚当斯在《银河系漫游指南》中的观点是：'宇宙即答案'。我们需要思考的是，针对宇宙这个终极答案，我们该提出怎样的问题。界定问题才是难题所在，如果我们能正确界定问题，那么答案相对而言就简单了。

We need to expand the scope and scale of consciousness in order to understand what questions to ask of the universe. This is the path forward. If we do, we will be better able to understand the nature of the universe and understand the meaning of life. As just one example, we have to get back to the moon and build a science base there. I think we could learn a lot about the nature of the universe.[79]

我们需要扩展认知的广度和深度，才能理解应向宇宙提出哪些问题。这正是前进的方向。若能如此，我们将更深入地理解宇宙的本质与生命的意义。仅举一例：我们必须重返月球并在那里建立科研基地。我认为这将帮助我们深入了解宇宙的本质。[79]

3 “An Interview with Young Elon Musk in 2007,” PBS Wired Science, June 25, 2015, YouTube video, https://www.youtube.com/watch?v=tqoLRlpROG8.

3 “2007年年轻的埃隆·马斯克访谈”，PBS Wired Science，2015年6月25日，YouTube视频，https://www.youtube.com/watch?v=tqoLRlpROG8。

4 “Elon Musk: Digital Superintelligence, Multiplanetary Life, How to Be Useful,” Y Combinator, June 19, 2025, YouTube video, https://www.youtube.com/watch?v=cFIlta1GkiE.

4 "埃隆·马斯克：数字超级智能、多行星文明与价值创造之道"，Y Combinator，2025年6月19日，YouTube视频，https://www.youtube.com/watch?v=cFIlta1GkiE。

5 Lex Fridman and Elon Musk, “Elon Musk: Neuralink and the Future of Humanity | Lex Fridman Podcast #438,” Lex Fridman, August 2, 2024, YouTube video, 8:37:34, https://www.youtube.com/watch?v=Kbk9BiPhm7o.

5 莱克斯·弗里德曼对话埃隆·马斯克，"Neuralink与人类未来 | 莱克斯·弗里德曼播客第438期"，莱克斯·弗里德曼频道，2024年8月2日，YouTube视频，时长8:37:34，https://www.youtube.com/watch?v=Kbk9BiPhm7o。

6 “Elon Musk: Birthrate Might Be the Biggest Threat to the Future of Human Civilization,” WELT Documentary, April 15, 2022, YouTube video, 47:49, https://www.youtube.com/watch?v=2WX_mgnAFA0.

6 "埃隆·马斯克：出生率可能是人类文明未来的最大威胁"，《世界报》纪录片，2022年4月15日，YouTube视频，47分49秒，https://www.youtube.com/watch?v=2WX_mgnAFA0。

更多资源 https://mirrorsite.org

7 Lex Fridman and Elon Musk, “Elon Musk: SpaceX, Mars, Tesla Autopilot, Self-Driving, Robotics, and AI | Lex Fridman Podcast #252,” Lex Fridman, December 28, 2021, YouTube video, 2:31:47, https://www.youtube.com/watch?v=DxREm3s1scA.

7 莱克斯·弗里德曼与埃隆·马斯克，"埃隆·马斯克：太空探索技术公司、火星、特斯拉自动驾驶、自动驾驶、机器人技术与人工智能 | 《莱克斯·弗里德曼播客第252期》"，莱克斯·弗里德曼，2021年12月28日，YouTube视频，2小时31分47秒，https://www.youtube.com/watch?v=DxREm3s1scA。

8 “TIME Person of the Year: Elon Musk,” *TIME*, December 13, 2021, YouTube video, 12:42, https://www.youtube.com/watch?v=PbVSZvC7UxY.

8 “《时代》周刊年度人物：埃隆·马斯克”，*TIME*，2021年12月13日，YouTube视频，12分42秒，https://www.youtube.com/watch?v=PbVSZvC7UxY。

9 “Tesla AI Day 2022,” Tesla, September 30, 2022, YouTube video, 3:23:00, https://www.youtube.com/watch?v=ODSJsviD_SU.

9 “2022 特斯拉 AI 日”， 特斯拉， 2022 年 9 月 30 日， YouTube 视频， 3 小时 23 分钟，https://www.youtube.com/watch?v=ODSJsviD_SU。

10 “Elon Musk: Digital Superintelligence,” Y Combinator.

10 "埃隆·马斯克：数字超级智能", Y Combinator。

11 “Elon Musk on How to Build the Future,” transcript, Y Combinator, 2016, https://www.ycombinator.com/library/6W-elon-musk-on-how-to-build-the-future.

11 "埃隆·马斯克谈如何构建未来"， 文字稿， Y Combinator， 2016 年，https://www.ycombinator.com/library/6W-elon-musk-on-how-to-build-the-future。

12 “Elon Musk’s Vision for the Future,” Stanford eCorner, October 7, 2015, https://ecorner.stanford.edu/wp-content/uploads/sites/2/2015/10/3620.pdf.

12 "埃隆·马斯克的未来愿景"， 斯坦福大学 eCorner， 2015 年 10 月 7 日，https://ecorner.stanford.edu/wp-content/uploads/sites/2/2015/10/3620.pdf。

13 “Elon Musk's Vision for the Future.”

13 「埃隆·马斯克的未来愿景」

14 Elon Musk (@elonmusk), “Broad Subject Interview with @DavidFaber,” X Spaces, audio, May 16, 2023, https://twitter.com/i/spaces/1RDxlavQq_aRKL.

14 埃隆·马斯克 (@elonmusk)，「与@DavidFaber的广泛主题访谈」，X空间，音频，2023年5月16日，https://twitter.com/i/spaces/1RDxlavQqaRKL

15 Johnny Davis, “One More Giant Leap,” *The Telegraph*, August 4, 2007, https://www.telegraph.co.uk/culture/3666994/One-more-giant-leap.html.

更多资源 https://mirrorsite.org

15 约翰尼·戴维斯，「又一次巨大飞跃」，《每日电讯报》，2007年8月4日，https://www.telegraph.co.uk/culture/3666994/One-more-giant-leap.html

16 Fridman and Musk, “Lex Fridman Podcast #252.”

16 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

17 “Elon Musk Talks Twitter, Tesla and How His Brain Works: Live at TED2022,” TED, April 14, 2022, YouTube video, 54:45, https://www.youtube.com/watch?v=cdZZpaB2kDM.

17 《埃隆·马斯克畅谈推特、特斯拉及大脑运作机制：TED2022现场实录》，TED大会，2022年4月14日，YouTube视频，54分45秒，https://www.youtube.com/watch?v=cdZZpaB2kDM

18 Jordan Peterson and Elon Musk, “Dr. Peterson x Elon Musk,” X Spaces, audio, July 22, 2024, https://x.com/i/broadcasts/1LyGBgPvoDjJN.

18 乔丹·彼得森博士与埃隆·马斯克，《彼得森博士访谈》彼得森与埃隆·马斯克，X空间，音频，2024年7月22日，https://x.com/i/broadcasts/1LyGBgPvoDjJN。

19 “Elon Musk at TED2022.”

19 “埃隆·马斯克在TED2022大会”

20 “Elon Musk: Tesla Motors CEO, Stanford GSB 2013 Entrepreneurial Company of the Year,” Stanford Graduate School of Business, October 9, 2013, YouTube video, 53:08, https://www.youtube.com/watch?v=MBItc_QAUUM.

20 “埃隆·马斯克：特斯拉汽车公司CEO，斯坦福商学院2013年度创业公司”，斯坦福大学商学院，2013年10月9日，YouTube视频，53:08，https://www.youtube.com/watch?v=MBItc_QAUUM

21 “Elon Musk in 2009—Charlie Rose Interview,” Remembrance of Things Past, originally from August 11, 2009, uploaded March 12, 2020, YouTube video, 29:28, https://www.youtube.com/watch?v=ktkV0N0Oask.

21 《2009年埃隆·马斯克——查理·罗斯专访》，往事回忆录，源视频发布于2009年8月11日，上传日期2020年3月12日，YouTube视频，29分28秒，https://www.youtube.com/watch?v=ktkV0N0Oask。

22 “Elon Musk's Vision for the Future.”

22 《查理·罗斯访谈埃隆·马斯克 的未来愿景》

23 “Elon Musk, Charlie Rose Interview (2009).”

23 “埃隆·马斯克接受查理·罗斯专访（2009年）”

24 “Elon Musk, Charlie Rose Interview (2009).”

24 “埃隆·马斯克接受查理·罗斯专访（2009年）”

更多资源 https://mirrorsite.org

25 “Elon Musk: The Future We’re Building—and Boring,” TED, May 3, 2017, YouTube video, 40:50, https://www.youtube.com/watch?v=zIwLWfaAg-8.

25 “埃隆·马斯克：我们正在建设的未来——以及'无聊'”，TED大会，2017年5月3日，YouTube视频，40:50，https://www.youtube.com/watch?v=zIwLWfaAg-8

26 Tim Urban, “The Cook and the Chef: Musk’s Secret Sauce,” *Wait But Why* (blog), November 6, 2015, https://waitbutwhy.com/2015/11/the-cook-and-the-chef-musks-secret-sauce.html.

26 蒂姆·厄本，《厨师与大厨：马斯克的秘诀》，《等等，但为什么》（博客），2015年11月6日，https://waitbutwhy.com/2015/11/the-cook-and-the-chef-musks-secret-sauce.html。

27 Urban, “The Cook and the Chef.”

27 厄本，《厨师与 大厨》。

28 “Third Row Tesla Podcast: Episode 7: Elon Musk’s Story: Director’s Cut,” Third Row Tesla, February 9, 2020, YouTube video, 3:35:03, https://www.youtube.com/watch?v=J9oEc0wCQDE.

28 "特斯拉第三排播客：第7章：埃隆·马斯克的故事：导演剪辑版"，特斯拉第三排播客，2020 年 2 月 9 日， YouTube 视 频 ， 3 小 时 35 分 03 秒 ， https://www.youtube.com/watch?v=J9oEc0wCQDE。

29 Musk (@elonmusk), X account.

29 马斯克 (@elonmusk)，X 账号。

30 Joe Rogan and Elon Musk, “Joe Rogan Experience #1169: Elon Musk,” Powerful JRE, September 6, 2018, YouTube video, 2:37:02, https://www.youtube.com/watch?v=ycPr5-27vSI.

30 乔·罗根与埃隆·马斯克，《强力乔·罗根秀第1169期：埃隆·马斯克》，2018年9月6日，YouTube视频，2:37:02，https://www.youtube.com/watch?v=ycPr5-27vSI

31 “Bill Gates and Elon Musk Interviewed by Baidu CEO Robin Li,” Science, Technology & the Future, April 15, 2015, YouTube video, 55:49, https://www.youtube.com/watch?v=6DBNKRYVY8g.

31 《比尔·盖茨与埃隆·马斯克接受百度首席执行官李彦宏专访》，科技与未来论坛，2015年4月15日，YouTube视频，55:49，https://www.youtube.com/watch?v=6DBNKRYVY8g

32 “Musk, Stanford GSB 2013.”

32 “马斯克，斯坦福商学院 2013。”

33 Fridman and Musk, “Lex Fridman Podcast #252.”

33 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

34 “Bill Gates and Elon Musk,” Baidu.

34 “比尔·盖茨与埃隆·马斯克”，百度。

更多资源 https://mirrorsite.org

35 “Elon Musk’s 2003 Stanford University Entrepreneurial Thought Leaders Lecture,” Stanford eCorner, shazmosushi, July 12, 2013, YouTube video, 47:58, https://www.youtube.com/watch?v=afZTrfvB2AQ.

35 “埃隆·马斯克2003年斯坦福大学创业思想领袖讲座”，Stanford eCorner，shazmosushi，2013年7月12日，YouTube视频，47分58秒，https://www.youtube.com/watch?v=afZTrfvB2AQ。

36 “Musk's 2003 Stanford Lecture.”

36 “马斯克的2003年斯坦福大学 演讲。”

37 “Musk's 2003 Stanford Lecture.”

37 “马斯克的2003年斯坦福大学 演讲。”

38 “Bill Gates and Elon Musk,” Baidu.

38 “比尔·盖茨与埃隆·马斯克”，百度。

39 Walter Isaacson, *Elon Musk* (Simon & Schuster, 2023).

39 沃尔特·艾萨克森，埃隆·马斯克（Simon & Schuster，2023）。

40 “2016 Annual Shareholder Meeting,” Tesla, May 31, 2016, https://www.tesla.com/2016shareholdermeeting.

40 “2016 年度股东大会”，特斯拉，2016 年 5 月 31 日，https://www.tesla.com/2016shareholdermeeting。

41 “RAW Elon Musk Interview from Air Warfare Symposium 2020,” The Space Archive, March 2, 2020, YouTube video, 59:01, https://www.youtube.com/watch?v=sp8smJFaKYE.

41 “2020空中作战研讨会埃隆·马斯克未剪辑专访”，太空档案，2020年3月2日，YouTube视频，59:01，https://www.youtube.com/watch?v=sp8smJFaKYE。

42 “Elon Musk, Air Warfare Symposium 2020.”

42 “埃隆·马斯克，空中作战研讨会 2020。”

43 “Ron Baron Interviews Elon Musk at the 29th Annual Baron Investment Conference,” Baron Capital, January 4, 2023, YouTube video, 1:00:19, https://www.youtube.com/watch?v=E-squeb0YJA.

43 “罗恩·巴伦在第29届巴伦投资年会上采访埃隆·马斯克”，巴伦资本，2023年1月4日，YouTube视频，1小时00分19秒，https://www.youtube.com/watch?v=E-squeb0YJA。

44 Tim Dodd, “Go Up SpaceX’s Starship-Catching Robotic Launch Tower with Elon Musk!,” Everyday Astronaut, May 26, 2022,YouTube video, 32:58, https://www.youtube.com/watch?v=XP5k3ZzPf_0.

更多资源 https://mirrorsite.org

44 蒂姆·多德，“与埃隆·马斯克一同登上太空探索技术公司的星舰捕获机器人发射塔！”，每日宇航员， 2022年5月26日， YouTube视频， 32分58秒， https://www.youtube.com/watch?v=XP5k3ZzPf_0。

45 Fridman and Musk, “Lex Fridman Podcast #252.”

45 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

46 Fridman and Musk, “Lex Fridman Podcast #252.”

46 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

47 Fridman and Musk, “Lex Fridman Podcast #252.”

47 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

48 Isaacson, *Elon Musk*.

48 沃尔特·艾萨克森，埃隆 马斯克。

49 Sriram Krishnan and Aarthi Ramamurthy, “Elon Musk Clubhouse Interview,” The Good Time Show, Austin Byrd, January 31, 2021, YouTube video, 1:37:26, https://www.youtube.com/watch?v=4_qxJEsvvSA.

49 克里希南与拉玛穆尔蒂，《埃隆·马斯克俱乐部会所访谈》，The Good Time Show，奥斯汀·伯德，2021年1月31日，YouTube视频，1小时37分26秒，https://www.youtube.com/watch?v=4_qxJEsvvSA。

50 Isaacson, *Elon Musk*.

50 沃尔特·艾萨克森，埃隆 马斯克。

51 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

51 克里希南与拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 专访》

52 Musk, “Interview with David Faber,” X Spaces.

52 马斯克，《大卫·费伯专访》，X 空间

53 “A Candid Interview with Tesla CEO Elon Musk,” Vator, August 11, 2010, YouTube video, 18:41, https://www.youtube.com/watch?v=B1h1aG0usIY.

53 《特斯拉CEO埃隆·马斯克深度专访》，维特，2010年8月11日，YouTube视频，18分41秒，https://www.youtube.com/watch?v=B1h1aG0usIY

54 “Elon Musk USC Commencement Speech | USC Marshall School of Business Undergraduate Commencement 2014,” USC, May 16, 2014, YouTube video, 6:16, https://www.youtube.com/watch?v=e7Qh-vwpYH8.

更多资源 https://mirrorsite.org

54 《埃隆·马斯克南加州大学毕业典礼演讲 | 2014届南加州大学马歇尔商学院本科生毕业典礼》，南加州大学，2014年5月16日，YouTube视频，6分16秒，https://www.youtube.com/watch?v=e7Qh-vwpYH8。

55 “Candid Interview with Tesla CEO,” Vator.

55 《特斯拉CEO坦率采访》，维特。

56 Meghan Daum, “Elon Musk Wants to Change How (and Where) Humans Live,” *Vogue*, September 21, 2015, https://www.vogue.com/article/elon-musk-profile-entrepreneur-spacex-tesla-motors.

56 梅根·达姆，《埃隆·马斯克欲改变人类生活方式（及居住地）》，《*Vogue*》，2015年9月21日，https://www.vogue.com/article/elon-musk-profile-entrepreneur-spacex-tesla-motors。

57 Musk (@elonmusk), X account.

57 马斯克 (@elonmusk), X 账号。

58 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

58 克里希南和拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》。

59 Isaacson, *Elon Musk*.

59 沃尔特·艾萨克森，《埃隆 马斯克》。

60 “Tesla AI Day 2022.”

60 “特斯拉AI日 2022”

61 “Tesla AI Day 2022.”

61 “特斯拉AI日 2022”

62 Musk (@elonmusk), X account.

62 马斯克（@elonmusk），X 账户

63 “Elon Musk Offers Advice to Young People,” Fox News, April 1, 2025, YouTube short video, 1:15, https://www.youtube.com/watch?v=3gSuepHv4Eg.

63 “埃隆·马斯克给年轻人的建议”，福克斯新闻台，2025年4月1日，YouTube短视频，1分15秒，https://www.youtube.com/watch?v=3gSuepHv4Eg

64 “Elon Musk on How to Build the Future.”

64 "埃隆·马斯克谈如何开创 未来"

65 “Elon Musk's Vision for the Future.”

更多资源 https://mirrorsite.org

65 "埃隆·马斯克对 未来的愿景"

66 Fridman and Musk, “Lex Fridman Podcast #252.”

66 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

67 “Musk, Stanford GSB 2013.”

67 “马斯克，斯坦福商学院 2013。”

68 “Elon Musk Reveals His Knowledge on Aliens, Challenges Putin to UFC, and Predicts WW3,” Full Send Podcast, August 4, 2022, YouTube video, 3:12:14, https://www.youtube.com/watch?v=fXS_gkWAIs0.

68 “埃隆·马斯克揭秘外星人知识，挑战普京进行UFC对决并预测第三次世界大战”，《全面放送》播客，2022年8月4日，YouTube视频，3小时12分，https://www.youtube.com/watch?v=fXS_gkWAIs0。

69 “Elon Musk,” Full Send Podcast.

69 “埃隆·马斯克”，《全面放送》 播客。

70 “Elon Musk,” Full Send Podcast.

70 《埃隆·马斯克》，Full Send 播客

71 “Elon Musk,” Full Send Podcast.

71 《埃隆·马斯克》，Full Send 播客

72 “Elon Musk,” Full Send Podcast.

72 《埃隆·马斯克》，Full Send 播客

73 “Elon Musk,” Full Send Podcast.

73 《埃隆·马斯克》，Full Send 播客。

74 “Elon Musk,” Full Send Podcast.

74 《埃隆·马斯克》，Full Send 播客。

75 Joe Rogan and Elon Musk, “Joe Rogan Experience #1470: Elon Musk,” Powerful JRE, May 7, 2020, YouTube video, 2:00:08, https://www.youtube.com/watch?v=RcYjXbSJBN8.

75 乔·罗根与埃隆·马斯克，《乔·罗根体验秀第1470期：埃隆·马斯克》，强力乔·罗根秀，2020年5月7日，YouTube视频，2小时00分08秒，https://www.youtube.com/watch?v=RcYjXbSJBN8。

76 “Elon Musk,” Full Send Podcast.

更多资源 https://mirrorsite.org

76 《埃隆·马斯克》，Full Send 播客节目。

77 Peterson and Musk, “Dr. Peterson x Elon Musk.”

77 彼得森与马斯克，《博士彼得森 x 埃隆 马斯克》

78 “Elon Musk,” Full Send Podcast.

78 《埃隆·马斯克》，Full Send 播客节目。

79 Fridman and Musk, “Lex Fridman Podcast #252.”

79 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

更多资源 https://mirrorsite.org

THINK LIKE A PHYSICIST

像物理学家一样思考

I try to be hyperrational.

我力求做到极度理性。

If the reasoning fits, and you’re not violating the laws of physics, that’s the thing you should try to do.

只要推理合理且不违反物理学定律，这就是你应该尝试的方向。

These things just don’t seem that crazy to me.[80]

这些事在我看来并不那么疯狂。[80]

更多资源 https://mirrorsite.org

OBSESS OVER TRUTH

痴迷于真理

> Start somewhere. Then be prepared to question your assumptions, fix what you did wrong, and adapt to reality.[81]
>
> 从某个起点出发。然后准备好质疑你的假设，修正错误，并适应现实。[81]

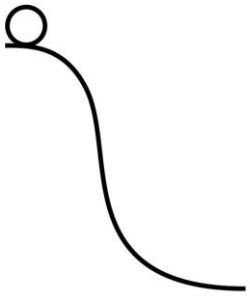
I am obsessed with truth. Obsessed.[82] If you're going to come up with a good solution, the truth is really, really important.[83]

I am obsessed with truth. Obsessed. | 我对真理极度痴迷。痴迷。[82] 若要提出优质解决方案，真相至关重要。[83]

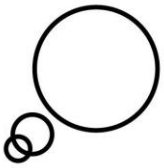
This obsession with truth is why I studied physics, because physics attempts to understand the truth of the universe. Physics is about finding the provable truths of the universe, and finding truths that have predictive power.[84]

正是这种对真理的痴迷驱使我研究物理学，因为物理学试图理解宇宙的真相。物理学的本质是探寻宇宙中可被证实的真理，以及具有预测效力的真理。[84]

更多资源 https://mirrorsite.org



物理学
即法则。



余者皆为
建议。

Physics is law. Everything else is a recommendation. I've met many people who can break the laws of man, but I have never met anyone who could break the laws of physics.

物理学是法则，其他一切都只是建议。我见过许多人能够打破人类社会的法律，但从未见过有人能打破物理法则。

更多资源 https://mirrorsite.org

For me, physics was a natural thing to study. It was intrinsically interesting to understand the nature of the universe. I also studied computer science and information theory to understand logic. (Information theory studies the transmission, processing, extraction, and use of information.) There's an argument that information theory is actually operating at a more fundamental level than physics.[85]

对我而言，研究物理学是件自然而然的事。理解宇宙的本质本身就充满内在吸引力。我还研究了计算机科学和信息论以理解其逻辑。（信息论研究信息的传输、处理、提取与利用。）有观点认为，信息论实际上在比物理学更基础的层面发挥作用。[85]

> Truth matters to me a lot. Pathologically, it matters to me.[86]
>
> 真相对我至关重要，极其重要。[86]

No matter how smart you are, you will make some number of mistakes. Everyone makes mistakes. It's just a question of how many and how often.[87]

无论你多么聪明，都难免会犯一定数量的错误。人人都会犯错。区别仅在于错误的数量多少与频率高低。[87]

In business and personal life, wishful thinking causes a lot of mistakes. You have to ask whether something is true or not. If something ever feels too easy or doesn't quite make sense…it is probably wishful thinking.[88]

在商业和个人生活中，一厢情愿的想法往往导致诸多失误。你必须追问事情是否属实。若某件事显得过于轻松或不合常理...那很可能只是一厢情愿的想法。[88]

更多资源 https://mirrorsite.org

Wishful thinking is a natural human tendency. It's a challenge to tell the difference between believing in a new idea and persevering or pursuing an unrealistic dream. You need to be rigorous in your self-analysis. Focus on something you're confident will have high value to someone else. Be rigorous in making that assessment too.[89]

一厢情愿是人类的天性。区分坚守新理念与执着于不切实际的梦想，实属不易。你必须对自我剖析保持严谨。聚焦于你确信对他人具备高价值的事物。此项评估同样需要严谨对待。[89]

The real test of any startup is how well it responds to adversity and adapts. When most things start out they don't make much sense, but as long as you adapt quickly you can make the company work.

初创企业的真正考验在于逆境应对与适应能力。多数事业起步时看似荒谬，但只要快速调整，就能让公司步入正轨。

> Being tenacious and super focused on the truth is extremely important. Look for feedback from all sources.[90]
>
> 坚韧不拔并极度求真至关重要。广纳各方反馈。[90]
>
> If you have beliefs that are incompatible with a rocket getting to orbit, the rocket will not get to orbit. Physics is a harsh judge.[91]
>
> 若持有与火箭入轨相悖的信念，火箭终将无法升空。物理学是严苛的判官。[91]

更多资源 https://mirrorsite.org

Do you have the right fundamental axioms, or truths? Are they relevant? Are you making the right conclusions based on those truths? That's the essence of critical thinking, and yet it is amazing how often people fail to do that. Wishful thinking is innate in the human brain. You want things to be the way you wish them to be, so you tend to filter out information you shouldn't.[92]

你是否把握了正确的基本公理或真理？它们是否具有现实关联性？你根据这些事实得出的结论是否正确？这就是批判性思维的本质所在，然而令人惊讶的是，人们往往未能做到这一点。一厢情愿的思维是人类大脑与生俱来的特质。人们总希望事态按预期发展，因此往往会过滤掉本不该忽视的信息。[92]

That's why I always assume we're losing, even when it looks like we might win.[93]

正因如此，即便胜券在握时，我也始终假设我们会失败。[93]

更多资源 https://mirrorsite.org

FIRST-PRINCIPLES THINKING

第一性原理思维

Q: Where does first-principles thinking come from?

问：第一性原理思维源自何处？

When you want to do something new, you have to apply the physics approach. Physicists discover counterintuitive new things, like quantum mechanics. They do that by thinking from “first principles”: building their reasoning from the ground up.[94]

当你着手创新时，必须采用物理学方法论。物理学家总能揭示反直觉的新规律，量子力学便是例证。他们通过运用'第一性原理'实现这一点：从零开始构建推理体系。[94]

> I would encourage people to use the mental tools of physics and apply them broadly in life. They are the best tools.[95]
>
> 我建议人们运用物理学的思维工具，并将其广泛应用于生活。这些是最佳工具。[95]

The normal way we conduct our lives is reasoning by analogy. That means we do something because it’s similar to something else, or what other people are doing.

我们通常的生活方式是采用类比推理。这意味着我们做某件事，是因为它与其他事物相似，或者因为别人也在这么做。

更多资源 https://mirrorsite.org

When you think this way, you only get slight iterations. It's easier to reason by analogy rather than from first principles, so that's what we do most of the time.[96] And in most of life, we should reason by analogy. Otherwise, mentally, you wouldn't be able to get through the day. It would be too much thinking.[97]

When you think this way, you only get slight iterations. It's easier to reason by analogy rather than from first principles, so that's what we do most of the time. | 采用这种思维方式，你只能获得微小的迭代改进。类比推理比第一性原理更易操作，因此我们多数时间都在这么做。[96] 在大多数生活场景中，我们确实应该采用类比推理。否则在思维层面，你根本无法应对日常事务。那样思考负担过重。[97]

But for important things, that kind of thinking is too bound by convention or prior experiences. You will hear, "It's always been done this way," or "Nobody's ever done it." That is a ridiculous way to think.

但对于重要事项，这种思维方式过于受制于常规或既往经验。你会听到'历来如此'或'从未有人做过'的说法，这简直是荒谬的思考方式。

Don't just follow the trends. You can avoid following trends by thinking with the physics approach, first principles. It's a powerful, powerful method for life in general.

切勿盲目追随潮流。运用物理学方法，通过第一性原理进行思考，可避免随波逐流。这在生活中是一种极其强大的通用方法。

Look at the fundamentals and construct your reasoning from there. Then see if you have a conclusion that works or doesn't work.[98] It might or might not be different from what people have done in the past.[99]

Look at the fundamentals and construct your reasoning from there. Then see if you have a conclusion that works or doesn't work. | 审视基础原理，并由此构建推理逻辑。进而验证结论是否成立。[98] 结果可能与前人做法相同或不同。[99]

更多资源 https://mirrorsite.org

Q: How do you apply first-principles thinking?

问：如何运用第一性原理思维？

Break something down to the most fundamental principles. Start by asking: What am I most confident is true at a foundational level? That sets your axiomatic base. Then you reason up from there. Then you check your conclusions against the axiomatic truths.

将事物分解至最基础的原理层面。首先自问：哪些根本性真理是我最确信的？这便确立了公理基础。继而由此向上推理。然后用基本原理检验你的结论。

For instance, to approach any new technology problem, make sure you're not violating physics with a first-principles analysis. A basic question in physics would be: Am I violating conservation of energy or momentum? If so, it's not going to work. That's just to establish if this idea is possible.[100]

例如，面对任何新技术问题时，通过第一性原理分析，确保方案不违反物理定律。物理学的基本问题是：我是否违反了能量守恒或动量守恒？若是如此，方案必然行不通。这仅仅是验证构想的可行性。[100]

It's hard to think this way. It takes a lot of effort. But if you're trying to do something new, it's the best way to think.[101]

这种思维方式极具挑战，需要付出巨大努力。但若要实现创新突破，这无疑是最佳思考路径。[101]

Q: How have you applied first-principles thinking to building companies?

问：您如何将第一性原理思维应用于企业建设？

Here's an example from early in building Tesla. People said battery packs were too expensive to make cheap electric cars. They assumed they would always be expensive, because they had been in the past. That's pretty dumb.

更多资源 https://mirrorsite.org

If you applied that reasoning to everything new, then you would never try anything new. “Oh, nobody wants a car. Horses are great; we’re used to them. They can eat grass. There’s lots of grass all over the place. There’s no gasoline available. So people will never buy gas cars.” People did say that, a lot.

以特斯拉早期建设为例，人们曾表示电池组成本过高，无法制造廉价的电动汽车。他们假设电池价格会一直居高不下，因为过去便是如此。这想法太蠢了。若将此逻辑套用于所有新事物，人类将永远不敢尝试创新——'谁会要汽车呢？马匹多好，我们早已习惯。它们能吃草遍地都是青草又没地方加汽油所以人们永远不会买汽油车。'当时确实有大量此类言论。

People assumed batteries for electric vehicles would always cost $600 per kilowatt hour. The first-principles approach to battery costs is this: What are the batteries made of? What are the materials that make up the batteries? What is the market value of those material constituents?

人们曾认定电动汽车电池成本将永远维持在每千瓦时600美元。应对电池成本的第一性原理方法是：电池由什么构成？组成电池的材料是什么？这些材料的市场价值是多少？

It’s got cobalt, nickel, aluminum, carbon, some polymers for separation, and a steel can. Okay, what if we bought that amount of material at the London Metal Exchange? What would each of those things cost? Oh, geez, it’s only $80 per kilowatt hour. So clearly, we just need to think of clever ways to take those materials and combine them into the shape of a battery cell. That’s how I knew it was possible to build batteries much much cheaper than anyone else realized.[102]

电池含有钴、镍、铝、碳元素、用于隔层的聚合物，还有钢罐。那么，如果我们按这个材料配比在伦敦金属交易所采购呢？这些材料分别需要多少成本？哦，每千瓦时居然只要80美元。显而易见，我们只需构思巧妙方法，将这些材料组合成电池单元形态。正因如此，我确信电池制造成本完全可以远低于行业认知。[102]

更多资源 https://mirrorsite.org

> Great differences in technology exist in the world, which even hardcore technologists are unaware of.
>
> 技术领域存在巨大认知鸿沟，即使资深技术专家也未必察觉。
>
> What is simple in one arena is often profound in another.[103]
>
> 某个领域的基础常识，在另一领域往往成为突破性洞见。[103]

The first-principles approach is a good way to understand what new things are possible. It doesn't mean you'll be successful, but at least you can determine if success is one of the possibilities, and that is important. This is how I decided to start SpaceX.[104]

第一-性原理分析法，是判断创新可能性的有效路径。这虽不能保证成功，但至少能验证成功是否属于可能选项，而这点至关重要。这就是我决定创立太空探索技术公司的初衷。[104]

First-principles thinking built SpaceX. Most people think, "Historically, all rockets have been expensive. Therefore, in the future, all rockets will be expensive." But that's not true.[105] This is where it's helpful to use the analytical approach again.[106]

First-principles thinking built SpaceX. Most people think, "Historically, all rockets have been expensive. Therefore, in the future, all rockets will be expensive." But that's not true. | 第一性原理思维构建了太空探索技术公司。大多数人认为："从历史上看，所有火箭都很昂贵。" 因此未来所有火箭仍将昂贵——但事实并非如此。"[105] 这正是再次运用分析方法论的用武之地。[106]

更多资源 https://mirrorsite.org

The way we applied first-principles thinking to rocketry was asking, “What are the materials that go into a rocket?”[107] A rocket is made from aluminum, titanium, copper, and carbon fiber. Break it down further and ask, “How much of each material is used? Now, what is the cost of all these raw components?”[108]

The way we applied first-principles thinking to rocketry was asking, “What are the materials that go into a rocket?” | 我们将第一性原理思维应用于火箭技术的方式是追问：“构成火箭的材料有哪些？”[107] 火箭由铝、钛、铜和碳纤维构成。进一步拆解追问：“每种材料的使用量是多少？这些原材料的成本又是多少？”[108]

If you have them stacked on the floor and could wave a magic wand to create the rocket, what would the cost of the rocket be? We imagine the cost of rearranging the atoms was zero.[109]

若将它们堆放在地板上，只需挥动魔法棒就能造出火箭，那么火箭的实际成本会是多少？我们设想重新排列原子的成本为零。[109]

That’s going to set the floor of the cost of the rocket. I call this the “magic wand number,” the hypothetical best-case scenario. For rockets, that turned out to be a relatively small number, well under 5 percent of the current cost, in some cases closer to 1 or 2 percent.[110] The manufacturing must be very inefficient if the raw material cost is only 1 or 2 percent of the finished product.[111]

That’s going to set the floor of the cost of the rocket. I call this the “magic wand number,” the hypothetical best-case scenario. For rockets, that turned out to be a relatively small number, well under 5 percent of the current cost, in some cases closer to 1 or 2 percent. | 这将奠定火箭的成本底线。我称之为'魔杖数字'，即假设性的最佳情境。 对于火箭而言，这个数字相对较小，远低于当前成本的5%，某些情况下甚至接近1%或2%。[110] 若原材料成本仅占成品成本的1%或2%，说明制造工艺效率极低。[111]

更多资源 https://mirrorsite.org

I was able to see a great deal of room for improvement.[112] Now our challenge was to figure out how to get the atoms in the right shape more efficiently.[113]

I was able to see a great deal of room for improvement. | 我发现了巨大的改进空间。[112] 我们当前的挑战是如何更高效地让原子排列成正确形态。[113]

That first-principles thought process around the rocket became general purpose for all parts. I call it “The Idiot Index.” How much more does a finished product cost than the cost of its materials? If a part or product had a high Idiot Index, we could cut the cost with more efficient manufacturing techniques.[114]

围绕火箭展开的第一性原理思维模式，后来被应用于所有部件。我称之为'白痴指数'：成品成本相比其原材料成本高出多少？若某个部件或产品的'白痴指数'过高，可通过优化制造工艺来降低成本。[114]

A component that costs $1,000 when the aluminum it was made of costs only ten dollars likely has a design that is too complex or an inefficient manufacturing process. If the ratio is high, you’re an idiot.

当原材料铝材仅价值十美元时，售价1000美元的部件很可能存在设计冗余或低效生产工艺。该比值越高，设计者越愚蠢。

One part of the rocket, the half nozzle jacket, cost $13,000. But it was only made of $200 worth of steel. I expect all my engineers to know all the best and worst parts in their systems as judged by the idiot index at all times.[115]

火箭半喷嘴护套部件的成本高达13,000美元。但其原材料钢材价值仅为200美元。我要求所有工程师必须时刻掌握系统中'白痴指数'评价下的最优与最差部件。[115]

That’s what I mean by thinking about things from a first-principles standpoint. If I had analyzed it by analogy and said, “What are all other rocket companies doing? What do their rockets cost? What historically have

更多资源 https://mirrorsite.org

other rockets cost?" That is reasoning by analogy, but *it really doesn't illustrate what the true potential is*.[116]

这就是我强调的第一性原理思维方式。若采用类比推理：'其他火箭公司如何运作？其火箭成本多少？历史火箭成本几何？' 这种类比无法揭示真正的潜力边界。[116]

> The first-principles approach is a good way to figure out counterintuitive solutions. It was a helpful thing to learn.[117]
>
> 第一性原理方法是找出反直觉解决方案的有效途径。这是值得学习的有益经验。[117]

更多资源 https://mirrorsite.org

THINKING IN LIMITS

极限思考

Another good physics tool is thinking about things “in the limit.” Take a particular idea and imagine scaling it to a very large or very small number. How do things change?[118]

另一个优秀的物理学工具是'极限思考'：选取特定概念，将其极限推演至极大或极小值，观察事物如何演变。[118]

The Boring Company is a great example. A common criticism of the idea of tunnels is: The tunnel will get used up and there will still be traffic congestion. They don’t realize there’s no real limit to *how many* levels of tunnel you can have. You can go much farther deep underground than you can build up. The deepest mines are much deeper than the tallest buildings are tall.

隧道挖掘公司堪称典范案例。针对隧道方案的典型质疑是：隧道终将饱和，交通拥堵问题依然存在。他们未能意识到隧道层数没有实质上限。 地下纵深拓展潜力远超地上建筑高度。最深的矿井深度远超过最高建筑的高度。

Ever notice that cities are built in 3D, but roads are only built in 2D? You could build roads in 3D by building tunnels under cities.[119] You can alleviate any amount of urban congestion with a 3D tunnel network.[120]

Ever notice that cities are built in 3D, but roads are only built in 2D? You could build roads in 3D by building tunnels under cities. | 可曾注意到城市是三维建造的，而道路却仅停留在二维层面？可以通过在城市地下建造隧道来实现三维道路建设。[119] 三维隧道网络能彻底解决城市拥堵问题。[120]

更多资源 https://mirrorsite.org

But, it’s difficult and expensive to dig tunnels the way they’re currently done. The LA subway extension cost roughly a billion dollars per mile to build.[121]

但当前隧道挖掘方式成本高昂且难度极大。洛杉矶地铁延伸段每英里建造成本约十亿美元。[121]

> If you do just two things, you can get approximately an order of magnitude improvement in tunneling.
>
> 只需采取两项措施，隧道挖掘效率就能提升约一个数量级。
>
> But I think you can even go beyond that.[122]
>
> 但我认为突破这个幅度完全可行。[122]

We need at least a tenfold improvement in the cost per mile of tunneling. The first thing to do is to cut the tunnel diameter. According to current regulations, a single road-lane tunnel has to be twenty-six to twenty-eight feet in diameter. But if you shrink that diameter to twelve feet, the area goes down by a factor of four. This is a huge improvement, because the cost of tunneling scales with the area. That’s almost a half-order of magnitude (4–5x) improvement in cost per mile right there.[123]

必须将每英里隧道成本降低至少十倍。首要措施是缩小隧道直径。现行规定要求，单条车道隧道直径必须达到二十六至二十八英尺。但若将直径缩小至十二英尺，面积便会缩减四倍。这是巨大的进步，因为隧道挖掘成本与截面面积成正比。仅此一项就使每英里成本实现近半个数量级（4-5倍）的改进。[123]

Currently, tunneling machines work for half the time, then stop. The other half of the time is putting in reinforcements for the tunnel wall. If you

更多资源 https://mirrorsite.org

design the machine instead to do continuous tunneling *and* reinforcing, that will give you a factor of two improvement. Combine those and that's a factor of eight.[124]

当前隧道掘进机仅运作半数时间便需停工。另一半时间则用于隧道壁的加固支撑施工。若将设备重新设计为同步掘进与加固，即可实现两倍的效率提升。叠加这两项改进，总效率将提升八倍。[124]

These machines are also far from being at their power or thermal limits, so we should jack up the power to the machine. We can get at least another factor of two there, maybe even four or five. Currently, we're not even close to the limits of tunneling technology.[125]

现有设备的功率与热负荷上限远未触及，我们应当大幅提升其工作功率。此举至少能再带来两倍效益，甚至可能达到四至五倍的提升空间。当前我们远未触及隧道技术的极限。[125]

Q: How does thinking in limits apply to manufacturing?

问：极限思维如何应用于制造业？

Let's say we're trying to figure out why a part or product is expensive. Is it because of something foolish, or just because production volume is too low?[126]

假设我们正在分析某个部件或产品价格高昂的原因。是设计存在缺陷，还是单纯因为产量不足？[126]

Ask, "If our volume was a million units per year, would it still be expensive?" If it's still expensive at a million units a year, then volume is not the reason why your part is expensive. Maybe something's wrong with the design. Maybe you can change the part to something not fundamentally expensive. That's thinking about things to the limit.[127]

试问：'若年产量达百万件，它仍会昂贵吗？' 若此时依然昂贵，则产量并非部件成本高的主因。可能是设计本身存在问题。或许可改用本

更多资源 https://mirrorsite.org

质上成本更低的替代部件。这正是极限思维的核心。[127]

If you are really good at manufacturing *and* producing at a high volume, you can make anything for a cost that asymptotically approaches the raw material value of the components, plus any intellectual property you need to license. It's a hard thing to do, but it is possible.[128]

若你真正精通规模化制造，任何产品的成本都能无限逼近原材料价值，加上必要知识产权许可费用。此事虽难，但确有可能实现。[128]

Q: How does thinking in the limit apply to design?

问：极限思维如何应用于设计？

When designing a product, people often start designing with the tools, parts, and methods they are familiar with. That's their default. That will lead to a product that can be made with those tools and methods, but it is unlikely to be the perfect product.[129]

人们在设计产品时，常会习惯性地从熟悉的工具、部件和方法入手，这是他们的默认起点。这种做法能产出可用现有工具和方法制造的产品，但很难达到完美。[129]

The other way to think is to imagine the platonic ideal of the perfect product or technology. What is the perfect arrangement of atoms that would be the best possible product? Now try to figure out how to get the atoms in that shape.[130]

另一种思路是构想理论上的完美产品或技术——柏拉图式的理想形态。原子应如何排列才能构成最佳产品？现在思考如何使原子达成该形态。[130]

Think through things in both directions. What can we build with the tools that we have? But also, what does the "theoretically perfect" product look like?[131]

更多资源 https://mirrorsite.org

双向思考：现有工具能构建什么？同时追问：'理论完美'的产品应是什么样？[131]

The idea of the “theoretically perfect” product is going to be a moving target because as you learn more, the definition for that perfect product will change. You don’t actually know what the perfect product is, but you can approximate a *more* perfect product. Then ask, “What tools, methods, or materials do we need to create to get the atoms in that shape?” People rarely think this way. But thinking in limits is a powerful tool.[132]

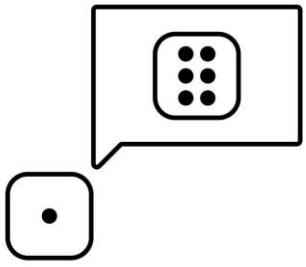
'理论完美'的概念是动态目标——随着认知深化，完美产品的定义会不断演变。你虽无法确知何为完美产品，但能逐步逼近更趋完美的方案。接着要问：‘我们需要创造什么工具、方法或材料，才能让原子形成那种结构？’人们很少这样思考。但极限思维是一种强大的工具。[132]

> Impossible is a strong word. It’s just a strong word. I approach things from a physics standpoint, and the word impossible is more or less banned in physics.[133]
>
> ‘不可能’是个语气强烈的词。它只是个语气强烈的词。我习惯从物理学角度思考问题，而‘不可能’这个词在物理学领域基本是被禁用的。[133]

At SpaceX especially, we often consider what’s possible within the absurd. If my team says something is impossible, I try to open their minds to new potential solutions by asking, “What would it take?”[134]

尤其在太空探索技术公司，我们经常思考荒谬范围内可能之事。当团队声称某事不可能时，我会通过‘需要什么条件？’的提问，引导他们开拓新的解决方案。[134]

更多资源 https://mirrorsite.org



犯错没关系，但不要既自信又犯错。

更多资源 https://mirrorsite.org

ASPIRE TO BE LESS WRONG

追求减少错误

The mental tools of physics are powerful. They tell us to assume we're wrong and that our goal is to be less wrong. Aspire to be less wrong. I don't think you're going to succeed every day in being less wrong. But if you can succeed in being less wrong most of the time, you're doing great.[135]

物理学思维工具威力强大。它们教导我们：先承认自己可能犯错，而目标就是减少错误。追求减少错误。我不认为你能每天都成功减少错误。但若能在多数时间成功减少错误，你已做得很出色。[135]

> It's OK to be wrong. Just don't be confident and wrong.[136]
>
> 犯错是可以接受的。但切勿在错误时还充满自信。[136]

Aspirationally, you want to believe things proportionate to the evidence. Not inversely proportional to the evidence.[137]

理想状态下，信念强度应与证据力度成正比。而非与证据力度成反比。[137]

> Most people can learn a lot more than they think they can.
>
> 多数人的学习潜力远超自我认知。

更多资源 https://mirrorsite.org

> They sell themselves short by not trying.[138]
>
> 他们因不敢尝试而自我设限。[138]

Read books, because the data rate of reading is much greater than when somebody is speaking. What's the output rate of speech? A couple hundred bits per second, maybe a few thousand per second if you're going full tilt. You can get several times that by reading. The main reason I didn't go to lectures in college was because the data rate was too slow.[139]

多读书，阅读的信息传递速率远高于语言表达。语言输出的速率是多少？约每秒数百比特，全速状态下可达数千比特。阅读可获取数倍于此的信息量。我大学不听课的主因就是信息传递速率太慢。[139]

> I encourage you to read a lot of books. Just read. Try to ingest as much information as you can.
>
> 我建议大家广泛阅读。只管读。尽可能吸收海量信息。

I was always really interested in reading. When I was a kid, I read everything I could get my hands on.[140] Around nine or ten I ran out of things to read in our house, so in desperation I read the encyclopedia—which turned out to be a good idea. I found all sorts of things I didn't even know existed—a lot, obviously.

I was always really interested in reading. When I was a kid, I read everything I could get my hands on. | 我始终保持着强烈的阅读兴趣。童年时我阅读了所有能接触到的读物。[140] 九岁左右读遍家中藏书，无奈啃起百科全书——结果证明这是个好主意。我发现了各种以前根本不知道存在的东西——显然，其中很多。

更多资源 https://mirrorsite.org

I'd recommend everyone read or skim through the condensed version of the *Encyclopedia Britannica*. You can always skip subjects. If you read a few paragraphs and know you're not interested, just jump to the next one.[141]

我建议每个人都阅读或浏览精简版的《大英百科全书》。你随时可以跳过某些主题。如果读了几段发现不感兴趣，直接跳到下一篇即可。[141]

Develop good general knowledge, so you at least have a rough "lay of the land" of the full knowledge landscape. Read a broad range of material. How can you know what you're really interested in if you're not at least doing a broad, light exploration of the knowledge landscape?[142]

培养良好的通识基础，这样你至少能对整个知识版图有个大致的轮廓认知。广泛涉猎各类材料。若不对知识版图进行广泛而浅显的探索，你怎能真正了解自己的兴趣所在？[142]

As a kid, I played historical strategy video games, like *Civilization*. This shows you how civilization formed. Through the technology tree, you invent different things. You'd invent literacy, democracy, and gunpowder. You start to realize, "Oh wow, there are stages to technology. You can't have democracy without creating literacy." There are stages of technology and development of ideas. That's a helpful framework.[143]

小时候我玩过历史策略类电子游戏，比如《文明》。 这能展示文明是如何形成的。通过科技树系统，你可以发明各种新事物。你会发明文字、民主制度和火药。你开始意识到：'原来技术发展是有阶段性的啊。'没有文化普及就无法实现民主。技术发展和理念演进存在阶段性特征。这是个有价值的分析框架。[143]

It is important to view knowledge as a semantic tree. Make sure you understand the fundamental principles (the trunk and big branches) before you get into the leaves (the details), then there is something for them to hang on to.[144]

更多资源 https://mirrorsite.org

将知识体系视作语义树至关重要。在深入细节（枝叶）之前，必须掌握基本原理（主干与大枝），后续知识才能有所依托。[144]

Some ideas come from reading about a sad trend in technology. When I read about the Concorde being retired, I was like, “Jeez, we don’t even have supersonic transport anymore. That’s terrible.” I never had a chance to fly on the Concorde. That seemed like a terrible thing, so I started reading about it.

部分创新灵感源于对技术领域衰退趋势的洞察。获悉协和超音速客机退役时，我不禁感叹：'天哪，我们连超音速运输工具都失去了这令人扼腕。'我始终无缘体验协和客机。深感遗憾之余，我开始系统研究其技术沿革。

I learned the Concorde was designed back in the sixties. Aerodynamics have improved a great deal since then, with computational fluid dynamics. Engine efficiencies have improved massively. Even if you just change the engines on the Concorde, you could double the range or thereabouts. I thought, *Well, what if we could figure out an efficient design that could make it economically competitive to have a supersonic aircraft?* I started looking into it more and did the math on all of it.[145]

研究发现协和客机原始设计可追溯至六十年代。随着计算流体动力学的发展，空气动力学效率已实现质的飞跃。发动机能效取得突破性进展。仅通过发动机升级，协和客机的航程即可提升约一倍。我当时思考：如果我们能设计出高效方案，使超音速飞机具备经济竞争力会怎样？我开始深入研究，并对此进行了全面的数学演算。[145]

You can get super efficient and super fast when electric aircraft have vertical takeoff and landing, and go supersonic. We could make a breakthrough aircraft several generations beyond what currently exists.[146]

当电动飞机实现垂直起降及超音速飞行时，即可达成超高效率与极速性能。我们能够研制出领先现有技术数代的突破性飞行器。[146]

更多资源 https://mirrorsite.org

Diving into SpaceX and Tesla, I had to learn how to make hardware. I'd never seen a CNC machine or laid out carbon fiber. I didn't know any of those things, but if you read books and talk to experts, you can pick them up quickly.[147] I started going to the Palo Alto public library to read about rocket engineering and started calling experts, asking to borrow their old engine manuals.[148]

Diving into SpaceX and Tesla, I had to learn how to make hardware. I'd never seen a CNC machine or laid out carbon fiber. I didn't know any of those things, but if you read books and talk to experts, you can pick them up quickly. | 投身太空探索技术公司和特斯拉事业时，我必须掌握硬件制造技术。我从未接触过数控机床，也不曾参与碳纤维布局工艺。这些知识我原本都不懂，但通过阅读典籍与请教专家，你便能迅速掌握。[147] 我开始前往帕洛阿尔托公共图书馆研读火箭工程学文献，并致电专家请求借阅旧版发动机手册。[148]

Most people self-limit their ability to learn. It's pretty straightforward—just read books and talk to people.[149]

多数人自我限制了学习能力。这相当简单直接——就是多读书、多与人交流。[149]

The physics background is helpful as the foundation. But in rocketry I am self-taught, meaning I don't have an aerospace degree. I just read a lot of books and talked to a lot of people.[150]

物理学背景作为基础非常有帮助。但在火箭技术领域，我是自学成才，意思是我没有航空航天学位。我就是读了很多书，和很多人交流过。[150]

> Talk to people from different walks of life, in different industries, professions, and skills. Try to learn as much as possible. Search for meaning.[151]

更多资源 https://mirrorsite.org

> 要和来自不同生活背景、不同行业、职业和技能领域的人交流。尽可能多学习。探寻意义所在。[151]

80 “Third Row Tesla Podcast, Episode 7.”

80 “特斯拉第三排播客，第 7章节。”

81 Elon Musk and Sam Altman, “Elon Musk and Y Combinator President on Thinking for the Future: FULL CONVERSATION,” Vanity Fair, October 8, 2015, YouTube video, 47:53, https://www.youtube.com/watch?v=SqEo107j-uw.

81 埃隆·马斯克和萨姆·阿尔特曼，“埃隆·马斯克与Y Combinator主席关于未来思维的对话：完整版”，《名利场》，2015年10月8日，YouTube视频，47:53，https://www.youtube.com/watch?v=SqEo107j-uw。

82 “Elon Musk at TED2022.”

82 "埃隆·马斯克在 TED2022大会上的演讲。"

83 “Tesla CEO Elon Musk (2014),” Auto Bild, November 5, 2014, YouTube video, 34:01, https://youtu.be/FE4iFYqi4QU?t=897.

83 "特斯拉CEO埃隆·马斯克（2014）", 《Auto Bild》, 2014年11月5日, YouTube视频, 34:01, https://youtu.be/FE4iFYqi4QU?t=897.

84 “Elon Musk at TED2022.”

84 "埃隆·马斯克在 TED2022大会上的演讲。"

85 “Elon Musk at TED2022.”

85 "埃隆·马斯克在 TED2022大会"

86 “Elon Musk at TED2022.”

86 "埃隆·马斯克在 TED2022大会"

87 “Interview with Elon Musk: 29 September 2011,” The Motley Fool, November 23, 2021, YouTube video, 36:46, https://www.youtube.com/watch?v=bg06ojAR_lE.

87 "埃隆·马斯克专访：2011年9月29日"，The Motley Fool，2021年11月23日，YouTube视频，36分46秒，https://www.youtube.com/watch?v=bg06ojAR_lE

88 “Elon Musk Answers Your Questions! | SXSW 2018,” SXSW, March 11, 2018, YouTube video, 1:11:37, https://www.youtube.com/watch?v=kzlUyrccbos.

更多资源 https://mirrorsite.org

88 “埃隆·马斯克回答你的问题！| 2018年西南偏南大会”，西南偏南大会，2018年3月11日，YouTube视频，1小时11分37秒，https://www.youtube.com/watch?v=kzlUyrccbos。

89 “Candid Interview with Tesla CEO,” Vator.

89 “特斯拉CEO坦诚访谈”，维特网。

90 “Dinner Program: To Infinity and Beyond: Jeff Skoll Talks with Elon and Kimbal Musk (Updated),” Milken Institute, July 12, 2013, YouTube video, 50:39, https://www.youtube.com/watch?v=T55CcN5c5as.

90 “晚宴活动：无限与超越：杰夫·斯科尔对话埃隆与金巴尔·马斯克（更新版）”，米尔肯研究所，2013年7月12日，YouTube视频，50分39秒，https://www.youtube.com/watch?v=T55CcN5c5as。

91 Peterson and Musk, “Dr. Peterson x Elon Musk.”

91 彼得森与马斯克，《博士彼得森 x 埃隆 马斯克》

92 “Clean Tech Summit 2011: IPO Spotlight with Elon Musk,” IBF: International Business Forum, February 3, 2011, YouTube video, 44:34, https://www.youtube.com/watch?v=hTBZGWEzR_E.

92 “2011清洁技术峰会：埃隆·马斯克IPO专题”，IBF国际商业论坛，2011年2月3日，YouTube视频，44:34，https://www.youtube.com/watch?v=hTBZGWEzR_E。

93 Musk (@elonmusk), X account.

93 马斯克（@elonmusk），X 账户。

94 “The Mind Behind Tesla, SpaceX, SolarCity … | Elon Musk,” TED, March 19, 2013, YouTube video, 21:04, https://www.youtube.com/watch?v=IgKWPdJWuBQ.

94 “特斯拉、太空探索技术公司、太阳城背后的思想者……| 埃隆·马斯克”，TED大会，2013年3月19日，YouTube视频，21:04，https://www.youtube.com/watch?v=IgKWPdJWuBQ。

95 Fridman and Musk, “Lex Fridman Podcast #252.”

95 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

96 “Elon Musk and Kevin Rose.”

96 埃隆·马斯克与凯文·罗斯访谈

97 “The Mind Behind Tesla, SpaceX, SolarCity.”

97 特斯拉、太空探索技术公司、太阳城公司背后的智慧

98 Urban, “The Cook and the Chef.”

98 厄本，《厨师与主厨》

更多资源 https://mirrorsite.org

99 “The Mind Behind Tesla, SpaceX, SolarCity.”

99 《特斯拉、太空探索技术公司、太阳城公司背后的智慧》

100 Fridman and Musk, “Lex Fridman Podcast #252.”

100 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

101 “Musk USC Commencement Speech.”

101 《马斯克南加州大学毕业典礼演讲》

102 “Elon Musk and Kevin Rose.”

102 《埃隆·马斯克与凯文·罗斯》

103 Musk (@elonmusk), X account.

103 马斯克(@elonmusk)，X账号。

104 “Elon Musk: The Future of Energy & Transport,” Oxford Martin School, November 22, 2012, YouTube video, 1:26:18, https://www.youtube.com/watch?v=c1HZIQliuoA.

104 《埃隆·马斯克：能源与交通的未来》，牛津马丁学院，2012年11月22日，YouTube视频，1:26:18，https://www.youtube.com/watch?v=c1HZIQliuoA。

105 Urban, “The Cook and the Chef.”

105 厄本，《厨师与主厨》。

106 “Future of Energy & Transport,” Oxford Martin School.

106 《能源与交通的未来》，牛津马丁 学院。

107 “Future of Energy & Transport,” Oxford Martin School.

107 《能源与交通的未来》，牛津马丁 学院。

108 Urban, “The Cook and the Chef.”

108 厄本，《厨师与 主厨》。

109 Urban, “The Cook and the Chef.”

109 厄本，《厨师与 主厨》

110 “Future of Energy & Transport,” Oxford Martin School.

110 《能源与交通的未来》，牛津大学马丁 学院

111 “Elon Musk: Digital Superintelligence,” Y Combinator.

更多资源 https://mirrorsite.org

111 《埃隆·马斯克：数字超级智能》，Y Combinator创业孵化器

112 “Future of Energy & Transport,” Oxford Martin School.

112 “能源与交通的未来”，牛津大学马丁 学院

113 Urban, “The Cook and the Chef.”

113 厄本，《厨师与主 厨》

114 Isaacson, *Elon Musk.*

114 沃尔特·艾萨克森，《埃隆 马斯克》

115 Isaacson, *Elon Musk.*

115 艾萨克森，《埃隆 马斯克》

116 “Future of Energy & Transport,” Oxford Martin School.

116 《能源与交通的未来》，牛津大学马丁 学院

117 “Elon Musk's Vision for the Future.”

117 《埃隆·马斯克的未来 愿景》

118 Fridman and Musk, “Lex Fridman Podcast #252.”

118 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

119 Isaacson, *Elon Musk.*

119 沃尔特·艾萨克森，埃隆 马斯克

120 “The Future We're Building—and Boring.”

120 《我们正在建设的未来——以及 博林公司》

121 “The Future We're Building—and Boring.”

121 “我们正在建设的未来——以及‘无聊’。”

122 “The Future We're Building—and Boring.”

122 “我们正在建设的未来——以及‘无聊’。”

123 “The Future We're Building—and Boring.”

123 “我们正在建设的未来——以及‘无聊’。”

124 “The Future We're Building—and Boring.”

更多资源 https://mirrorsite.org

124 “我们正在建造的未来——以及 无聊。”

125 “The Future We're Building—and Boring.”

125 “我们正在建造的未来——以及 无聊。”

126 Fridman and Musk, “Lex Fridman Podcast #252.”

126 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

127 Fridman and Musk, “Lex Fridman Podcast #252.”

127 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

128 Fridman and Musk, “Lex Fridman Podcast #252.”

128 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

129 Fridman and Musk, “Lex Fridman Podcast #252.”

129 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

130 Fridman and Musk, “Lex Fridman Podcast #252.”

130 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

131 Fridman and Musk, “Lex Fridman Podcast #252.”

131 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

132 Fridman and Musk, “Lex Fridman Podcast #252.”

132 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

133 “Birthrate Threat,” WELT Documentary.

133 《生育率危机》，《世界报》 纪录片

134 Eric Berger, *Liftoff: Elon Musk and the Desperate Early Days That Launched SpaceX* (William Morrow, 2021).

134 埃里克·伯杰，《升空：埃隆·马斯克与太空探索技术公司早期艰难创业岁月》（威廉·莫罗出版社，2021年）

135 Rogan and Musk, “JRE #1470.”

135 罗根与马斯克，《JRE第1470期》

136 Isaacson, *Elon Musk*.

136 沃尔特·艾萨克森，《埃隆 马斯克》

更多资源 https://mirrorsite.org

137 Joe Rogan and Elon Musk, "#1609: Elon Musk," February 11, 2021, in *The Joe Rogan Experience*, podcast, 3:24:00, https://open.spotify.com/episode/2aB2swgyXqbFA06AxPlFmr.

137 乔·罗根与埃隆·马斯克，《#1609：埃隆·马斯克》，2021年2月11日，乔·罗根体验，播客，3小时24分00秒，https://open.spotify.com/episode/2aB2swgyXqbFA06AxPlFmr

138 Elon Musk, "I Am Elon Musk, CEO/CTO of a Rocket Company, AMA!," Reddit, r/IAmA, January 5, 2015, https://www.reddit.com/r/IAmA/comments/2rgsan/i_am_elon_musk_ceocto_of_a_rocket_company_ama/.

138 埃隆·马斯克，《我是埃隆·马斯克，火箭公司CEO/CTO，AMA！》，Reddit论坛/r/IAmA，2015年1月5日，https://www.reddit.com/r/IAmA/comments/2rgsan/i_am_elon_musk_ceocto_of_a_rocket_company_ama/。

139 "Bill Gates and Elon Musk," Baidu.

139 《比尔·盖茨与埃隆·马斯克》，百度。

140 "Candid Interview with Tesla CEO," Vator.

140 《特斯拉CEO坦诚专访》，维特。

141 Fridman and Musk, "Lex Fridman Podcast #252."

141 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

142 Fridman and Musk, "Lex Fridman Podcast #252."

142 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

143 "Elon Musk: 10X Every 6 Months."

143 《埃隆·马斯克：每6 个月实现十倍增长》。

144 Musk, Reddit AMA.

144 马斯克，Reddit 问答环节。

145 "Pando Monthly Fireside Chat with Elon Musk," PandoMonthly, The Musk World, originally from July 17, 2012, uploaded October 27, 2023, YouTube video, 1:03:10, https://www.youtube.com/watch?v=1zzMe-b9ch4.

145 《潘多月度炉边谈话：埃隆·马斯克专访》，潘多月度[PandoMonthly]《马斯克的世界》栏目， 原发布于2012 年7 月17 日， 2023 年10 月27 日上传， YouTube 视频， 时长1:03:10，https://www.youtube.com/watch?v=1zzMe-b9ch4。

146 "Pando Monthly Fireside Chat."

146 《潘多月度炉边 谈话》

更多资源 https://mirrorsite.org

147 “Bill Gates and Elon Musk,” Baidu.

147 《比尔·盖茨与埃隆·马斯克》，百度。

148 Isaacson, *Elon Musk*.

148 沃尔特·艾萨克森，《埃隆·马斯克》。

149 “Bill Gates and Elon Musk,” Baidu.

149 《比尔·盖茨与埃隆·马斯克》，百度。

150 “2012: SpaceX: Elon Musk's Race to Space,” CBS News, 60 Minutes, December 9, 2018, YouTube video, 14:35, https://www.youtube.com/watch?v=23GzpbNUyI4.

150 《2012：SpaceX：埃隆·马斯克的太空竞赛》，CBS新闻《60分钟》节目，2018年12月9日，YouTube视频，14:35，https://www.youtube.com/watch?v=23GzpbNUyI4。

151 Fridman and Musk, “Lex Fridman Podcast #252.”

151 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

更多资源 https://mirrorsite.org

THE VALUE OF ENGINEERING

工程学价值

> I spend 80 percent of my time on engineering.[152]
>
> 我将80%的时间投入工程学领域。[152]

更多资源 https://mirrorsite.org

ENGINEERING IS MAGIC

工程学即魔法

> Engineering is, for all intents and purposes, magic, and who wouldn’t want to be a magician?[153]
>
> 工程学实质上就是魔法，谁不想成为魔法师呢？[153]

Q: What drew you to engineering?

问：是什么吸引您投身工程学？

> I have a physics background and grew up in an engineering-centric household. I’m still more an engineer than anything else.[154]
>
> 我拥有物理学背景，成长于一个以工程学为核心的家庭环境。归根结底，我始终更偏向工程师身份。[154]

My dad is an extremely talented electrical and mechanical engineer. We built model airplanes and circuit boards together when I was a kid. He tutored me, and I didn’t even know it at the time.[155] I also did things like make model rockets. In South Africa, there were no premade rockets. I had to go to the chemist to get the ingredients for rocket fuel, mix it, and put it in a pipe.[156]

更多资源 https://mirrorsite.org

My dad is an extremely talented electrical and mechanical engineer. We built model airplanes and circuit boards together when I was a kid. He tutored me, and I didn't even know it at the time. | 家父是位才华横溢的电气与机械工程师。童年时我们共同制作模型飞机和电路板。他在无形中给予我专业辅导，当时我甚至未曾察觉。[155] 我还参与过模型火箭制作等项目。在南非，没有现成的火箭组件。我必须前往化学用品店采购火箭燃料原料，自行调配后装入管道。[156]

There were lots of "engineery" things around me. When I asked for an explanation, I got the true explanation of how things work.[157] When I was a little kid, I was really scared of the dark. But I came to understand "dark" just means the absence of photons in the visible wavelength—four hundred to seven hundred nanometers. I thought, well it's silly to be afraid of a lack of photons. Then I wasn't afraid of the dark anymore.[158]

There were lots of "engineery" things around me. When I asked for an explanation, I got the true explanation of how things work. | 周遭充斥着各类工程类事物。每当寻求解释时，我总能获得事物运作原理的真实阐述。[157] 小时候，我特别害怕黑暗。但后来我明白，'黑暗'不过是指可见光波长（四百至七百纳米）范围内没有光子存在。我觉得，害怕光子缺失未免太傻了。从此我就不再惧怕黑暗了。[158]

I was very technology oriented as a kid growing up in South Africa.[159] With our first computer came books to teach yourself programming. This was the coolest thing I'd ever seen. When I was about twelve, I started programming and selling my own games to buy new games. I was hooked. I'd spend money on better computers, *Dungeons & Dragons* modules, and things like that. I was nerdmaster3000.[160]

I was very technology oriented as a kid growing up in South Africa. | 在南非成长的童年岁月里，我深深痴迷于技术。[159] 拥有第一台电脑时，配套的自学编程指南也随之而来。这曾是我眼中最酷的事物。约十二岁时，我开始编程并出售自制的游戏换取新游戏，彻底沉迷其中。我会

更多资源 https://mirrorsite.org

把钱花在升级电脑、购买龙与地下城模组这类东西上，堪称终极书呆子。[160]

I wasn’t that much of a loner, but I was quite bookish. I was reading all the time. I would be reading, working on my computer, reading comics, that kind of thing.[161]

我虽不算孤僻，但确实酷爱读书。我无时无刻不在阅读。我的日常就是读书、研究电脑、看漫画书这类活动。[161]

When I was young, I wasn’t sure what I was going to do when I got older. I thought the idea of inventing things would be cool, because I read a quote from Arthur C. Clarke: “A sufficiently advanced technology is indistinguishable from magic.” That’s really true.

年轻时，我并不确定长大后要做什么。我觉得发明创造的想法很酷，因为我读过阿瑟·克拉克的名言：'任何足够先进的技术，都与魔法无异。'这话千真万确。

If you go back three hundred years, you’d be burned at the stake for things we take for granted today. Being able to fly is crazy. Being able to see over long distances, communicate, and instantly access all the world’s information from almost anywhere on the earth. This would all be considered magic in times past. It actually goes beyond that. Many things we take for granted today weren’t imagined in times past, even in the realm of magic.

若回溯三百年前，今天我们视为理所当然的事物，足以让人被处以火刑。飞行能力堪称不可思议。能够远距离观察、交流，几乎在地球任何角落即时获取全球信息。这些在过去都会被视作魔法。事实上远不止于此。许多我们如今习以为常的事物，在过去连魔法领域都未曾设想。

I thought if I could advance technology, that would be like being a magician. That would be really cool.[162]

更多资源 https://mirrorsite.org

我想若能推动技术进步，就等同于成为魔法师。那才真正令人振奋。[162]

At one point, I was thinking about doing physics as a career. But to really advance physics these days, you need new data. Physics is fundamentally governed by the progress of engineering.

曾几何时，我考虑将物理学作为职业。但当今要真正推进物理学发展，需要新的数据。物理学从根本上受工程学进步主导。

There is always debate about, “Which is better, engineers or scientists? Aren’t scientists better? Wasn’t Einstein the smartest person?” Personally, I think engineering is better because without engineering, you do not have any new data. You hit a limit.

关于'工程师与科学家孰优孰劣'的争论始终存在。难道科学家不更胜一筹吗？爱因斯坦难道不是最聪明的人吗？我个人认为工程学更具价值，因为若无工程学，就无法获得新数据，终将遭遇瓶颈。

You can be smart within the context of the limits of the data you have, but unless you have a way to get more data, you can’t make progress. Galileo engineered the telescope, which allowed him to see Jupiter had moons. If you want to advance civilization, you must address the limiting factor. The limiting factor is the engineering. Therefore, you must address the engineering.[163]

你可以在现有数据限制内保持智慧，但除非能获取更多数据，否则无法取得进展。伽利略研制了望远镜，从而观测到木星拥有卫星。若要推动文明进步，必须解决制约因素。制约因素在于工程学。因此必须攻克工程学难题。[163]

I certainly admire the discoveries of the great scientists. They’re creating a deeper understanding of how the universe already works. That’s cool—but the universe, in a way, already knows that. They’re discovering what already exists.[164]

更多资源 https://mirrorsite.org

我确实钦佩伟大科学家们的发现。他们正深化对宇宙既有运行规律的理解。这很酷——但某种程度上，宇宙本身早已洞悉这些。他们只是在揭示既存事实。[164]

Science is discovering the essential truths about what exists in the universe.

科学旨在探索宇宙现存的本质真理。

Engineering is about creating things that have never existed before.[165]

工程学关乎创造前所未有的事物。[165]

更多资源 https://mirrorsite.org

ENGINEERING WINS WARS

工程学赢得战争

In Sun Tzu's *The Art of War*, there is no chapter on technology. It is an interesting book I've read many times. It's packed with wisdom, but there should be a chapter saying: "If you have a decisive technological advantage, you can win with minimal casualties to your side."[166]

在孙子的《孙子兵法》中，没有关于技术的章节。这本我反复研读的书充满趣味。它蕴含智慧，但应有章节指出：'若具备决定性技术优势，便能以己方最小伤亡取胜'。[166]

Technology plays a much stronger role in war than is generally understood: technology viewed in the broadest sense, including a better phalanx, or spears made of bronze, iron, or steel. These can be big differences.[167]

技术在战争中的作用远超普遍认知：广义的技术包括更精良的方阵，或青铜、铁器、钢材制造的矛戟。这些差异可能带来天壤之别。[167]

> The Romans won their wars through technology.[168]
>
> 罗马人凭借技术赢得战争。[168]

One of the advantages Romans had was good metallurgy. Their swords were martensitic (an improvement over austenitic metallurgy), so they were stronger. The Romans were often fighting opponents whose swords would basically bend over a Roman sword. If you're in a sword fight and your sword bends like a noodle…big disadvantage.[169]

更多资源 https://mirrorsite.org

其优势之一在于先进冶金技术。他们的剑采用马氏体（优于奥氏体冶金学），因而更为坚韧。罗马对手的剑刃常会在罗马剑锋下弯折。在剑斗中，如果你的剑像面条般弯曲……那将是巨大的劣势。[169]

The Romans were great engineers. Even things like building roads gave them a military advantage. If you're trying to march an army somewhere fast, roads beat the heck out of a small winding path through the forest.[170]

罗马人是伟大的工程学家。即使是修路这样的事，也能为他们带来军事优势。若要快速行军，宽阔道路远胜于林间蜿蜒小径。[170]

But when fighting outside the Roman empire, they sometimes lost their wars because of their opponent's technology. When the Romans fought the Scythians, they did not have a good counter to mounted war archers, especially if they got lured into flat terrain. They were pretty much helpless against the technology of a mounted archer.[171]

但在罗马帝国境外作战时，他们有时会因对手的技术而战败。当罗马人对战斯基泰人时，他们对骑射兵束手无策，尤其在平原地形被诱入时。面对骑射技术，他们几乎毫无招架之力。[171]

When there's a rapid change in the rate of technology, engineering plays a pivotal role.

当技术革新速率骤增时，工程学便成为决定性力量。

If there is a big difference in the technologies—even if the other side has more people, better generals, and is smarter—the side with the advanced technology will win.[172]

若技术存在代差——纵使对方兵多将广、谋略超群——掌握先进技术的一方终将取胜。[172]

更多资源 https://mirrorsite.org

The technology war of fighters and bombers during World War II is fascinating. The US completely crushed it on bombers at the end of the war, but they didn't start out that way. At the start of World War II in the Pacific, entire US squadrons were sometimes shot down with zero Japanese losses. A total KO. The US fighters at the beginning of World War II were not good either. Their tactics were terrible, the aircraft were terrible, and the training was incorrect, too.[173]

二战期间战斗机与轰炸机的技术博弈令人着迷。战争末期美军在轰炸机领域取得碾压式胜利，但初期并非如此。太平洋战争伊始，美军整支飞行中队曾遭全歼而日军零损失，堪称彻底击倒。战争初期的美军战斗机同样性能堪忧。他们的战术糟糕，战机糟糕，训练方法也糟糕。[173]

It's interesting to see where they started out and how fast things innovated. There was impressive design work by many countries: Japan, the US, Germany, UK, Russia, and others had some impressive fighter designs.[174]

观察他们的起步点和创新速度的演变很有意思。多国展现出令人印象深刻的设计：日本、美国、德国、英国、俄罗斯等国家都推出过杰出的战斗机设计。[174]

It was a constant technological rock-paper-scissors game. One country would make a plane, another made a new plane to beat that one, then another country would make an even newer plane. What really matters is the *pace* of innovation.[175]

这就像一场持续的技术石头-剪刀-布博弈。一国研制新战机，另一国就开发更先进的战机来压制，接着第三国又会推出更尖端的机型。真正关键的是创新速度。[175]

When the rate of change of technology is high enough, or there is a big technological difference between one side and the other, then that technology dominates and you get a lopsided victory.[176]

更多资源 https://mirrorsite.org

当技术迭代速率足够快，或交战双方存在显著技术代差时，技术优势将主导战局并导致压倒性胜利。[176]

Many books on the strategy of war actually don't address technology, or do only in a tangential manner. But obviously, if there is an overwhelming technological advantage, that side will win even if the odds are dramatically stacked against them.[177]

许多战争战略著作实际上并未深入探讨技术要素，或仅浅尝辄止。但显而易见，若一方拥有压倒性技术优势，即便胜算微乎其微，他们依然能赢得胜利。[177]

To use an extreme example (a limit case), if you can shoot lasers from space to any spot on the ground by just pointing at it, it would not matter if you're fighting Julius Caesar, Heinz Guderian, or Napoleon. They just got lasered from space.[178]

以极限案例说明：若能通过太空激光束精准打击地面任意目标，无论对手是尤利乌斯·凯撒、海因茨·古德里安还是拿破仑，结局都将湮灭于从天而降的激光束中。[178]

Most battles in history, because technology moved slowly, were more about maneuvering, tactics, and strategy. But when there's technological discontinuity, it fundamentally changes the whole situation. Wars in the modern era are very much technology race wars. How fast can we create new technology? The best example would be the nuclear bomb. Anyone who made nuclear bombs first, won. That's it. End of story.[179]

历史上多数战役因技术发展缓慢，更侧重于战术机动与战略部署。但当技术出现断层式突破，整个战局将发生根本性变革。现代战争本质上是技术竞赛的战争。我们创造新技术的速度有多快？核武器便是最佳例证。率先研制出核弹者即为胜者，毋庸置疑。[179]

That was the reason for the US Manhattan Project. People think it was a government project. I'd like to emphasize that it was a creation of the

更多资源 https://mirrorsite.org

physics community more than it was the government. The government supported it, but it was a decision and creation from the physics community. Without them, it would not have happened.[180]

这正是美国曼哈顿计划的初衷。人们普遍认为这是政府主导的项目。我需要强调：这更是物理学界的创举，而非政府之功。政府提供了支持，但这是物理学界作出的决策和创造。没有他们，这一切就不可能发生。[180]

They simply came to the conclusion that they couldn’t let Hitler have the bomb. So they made it first to be certain of it. There isn’t a better example of a super weapon—anyone who gets it wins.[181]

他们最终得出结论：绝不能允许希特勒拥有核弹。因此他们率先研制出来以确保这一点。这就是超级武器的本质——谁拥有它谁就获胜。[181]

> Play to win, or don’t play at all.[182]
>
> 要么全力以赴，要么干脆放弃。[182]

更多资源 https://mirrorsite.org

ENGINEERING CREATES VALUE

工程学创造价值

My mind feels like a wild storm. I have a fountain of ideas. I have more ideas than I could possibly execute. Innovation is not the problem. Execution is the problem.[183]

我的思维如同狂野风暴。我的创意源源不断。我的创意数量远超执行能力。创新并非症结所在。执行才是真正的难题。[183]

There is never a shortage of ideas. I find ideas to be somewhat trivial, but the execution of good ideas is extremely difficult. Prototypes are easy; production is hard. Production and being cash flow positive is excruciating pain. Product ideas are nearly irrelevant.[184]

创意永不枯竭。我认为创意本身微不足道，但优秀创意的执行极其艰难。原型易造，量产难成。实现量产与正向现金流是极度痛苦的历程。产品构思几乎无足轻重。[184]

You only build value in a company if you do hard work to solve tough problems. That’s why companies are valuable. It’s why they should be valuable, and largely why they are.

唯有通过解决难题的艰苦努力，才能为公司创造真正价值。这就是公司有价值的原因。这是它们应该有价值的原因，也大体上是它们之所以有价值的原因。

Tesla is a hardcore technology company. We do serious engineering. We do real manufacturing as well. We do hardcore manufacturing. Coils of aluminum and plastic pellets go into one end of the factory and cars come out the other. We did all the vehicle engineering, all the powertrain engineering, all the software. The evidence for us solving hard engineering

更多资源 https://mirrorsite.org

problems is that Toyota, Daimler, and Mercedes buy electric powertrains from us. If it was easy, they would do it.[185]

特斯拉是一家硬核技术公司。我们从事严谨的工程学。我们也进行真正的制造。我们从事硬核制造。铝卷和塑料粒子从工厂一端进入，汽车从另一端产出。我们完成了所有车辆工程、所有动力系统工程、所有软件工程。我们解决硬核工程难题的证据是：丰田、戴姆勒和奔驰都向我们购买电动动力系统。如果这事容易，他们自己就做了。[185]

The idea of going to Mars is not hard; that's irrelevant.

登陆火星的构想不是难事；那无关紧要。

Getting to Mars is the hard part.

抵达火星才是真正的挑战。

152 Musk (@elonmusk), X account.

152 马斯克 (@elonmusk)，X 账号。

153 Hannah Elliott, "At Home with Elon Musk: The (Soon-to-Be) Bachelor Billionaire," *Forbes*, March 26, 2012, https://www.forbes.com/sites/hannahelliott/2012/03/26/at-home-with-elon-musk-the-soon-to-be-bachelor-billionaire/?sh=6926dd2f729b.

153 汉娜·艾略特，《与埃隆·马斯克在家中：（即将成为）单身亿万富翁》，福布斯，2012年3月26日，https://www.forbes.com/sites/hannahelliott/2012/03/26/at-home-with-elon-musk-the-soon-to-be-bachelor-billionaire/?sh=6926dd2f729b。

154 John Battelle and Elon Musk, "Conversation with Elon Musk (Tesla Motors): Web 2.0 Summit 08," O'Reilly, November 10, 2008, YouTube video, 29:35, https://www.youtube.com/watch?v=gVwmNaPsxLc.

154 约翰·巴特尔与埃隆·马斯克，《对话埃隆·马斯克（特斯拉汽车公司）：Web 2.0峰会08》，奥莱利，2008年11月10日，YouTube视频，29分35秒，https://www.youtube.com/watch?v=gVwmNaPsxLc。

更多资源 https://mirrorsite.org

155 Berger, *Liftoff*.

155 伯杰，升空。

156 Chris Anderson, “Elon Musk’s Mission to Mars,” *Wired*, October 21, 2012, https://www.wired.com/2012/10/ff-elon-musk-qa/.

156 克里斯·安德森，《埃隆·马斯克的火星使命》，连线，2012年10月21日，https://www.wired.com/2012/10/ff-elon-musk-qa/。

157 Anderson, “Elon Musk's Mission to Mars.”

157 安德森，《埃隆·马斯克的火星使命》 。

158 Urban, “The Cook and the Chef.”

158 厄本，《厨师与 主厨》

159 “Elon Musk, Charlie Rose Interview (2009).”

159 《埃隆·马斯克查理·罗斯专访（2009）》

160 “CHM Revolutionaries: An Evening with Elon Musk,” Computer History Museum, recorded January 22, 2013, uploaded February 5, 2013, YouTube video, 1:16:51, https://www.youtube.com/watch?v=AHHwXUm3iIg.

160 《计算机历史博物馆革新者：与埃隆·马斯克共度之夜》，计算机历史博物馆，2013年1月22日录制，2013年2月5日上传，YouTube视频，1:16:51，https://www.youtube.com/watch?v=AHHwXUm3iIg

161 “CHM Revolutionaries: An Evening with Elon Musk.”

161 “计算机历史博物馆革新者：与埃隆·马斯克共度之夜。”

162 Elon Musk, “Elon Musk Commencement Speech at Caltech / CIT 2012,” YouTube video, 15:48, posted by “Elon Musk Best Videos,” November 22, 2015, .

162 埃隆·马斯克，《埃隆·马斯克在加州理工学院2012年毕业典礼演讲》，YouTube视频，15分48秒，由“埃隆·马斯克精选视频”发布于2015年11月22日， 。

163 Urban, “The Cook and the Chef.”

163 厄本，《厨师》

164 Urban, “The Cook and the Chef.”

164 厄本，《厨师》

165 Musk (@elonmusk), X account.

165 马斯克（@elonmusk），X 账户

更多资源 https://mirrorsite.org

166 Fridman and Musk, “Lex Fridman Podcast #252.”

166 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

167 Fridman and Musk, “Lex Fridman Podcast #252.”

167 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

168 Dan Carlin and Elon Musk, “EP17 Engineering Victory with Elon,” Dan Carlin’s Hardcore History: Addendum, Dan Carlin, December 13, 2021, YouTube video, 1:41:46, https://www.youtube.com/watch?v=T_Fa50Zc_3Y.

168 丹·卡林与埃隆·马斯克，《第17集：与埃隆共铸工程胜利》，丹·卡林的硬核历史：附录，丹·卡林，2021年12月13日，YouTube视频，1:41:46，https://www.youtube.com/watch?v=T_Fa50Zc_3Y。

169 Fridman and Musk, “Lex Fridman Podcast #252.”

169 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

170 Carlin and Musk, “Engineering Victory.”

170 卡林与马斯克，《工程学 胜利》

171 Carlin and Musk, “Engineering Victory.”

171 卡林与马斯克，《工程学 胜利》

172 Fridman and Musk, “Lex Fridman Podcast #252.”

172 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

173 Carlin and Musk, “Engineering Victory.”

173 卡林与马斯克，《工程学 胜利》。

174 Carlin and Musk, “Engineering Victory.”

174 卡林与马斯克，《工程学 胜利》。

175 Fridman and Musk, “Lex Fridman Podcast #252.”

175 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

176 Carlin and Musk, “Engineering Victory.”

176 卡林与马斯克，《工程学 胜利》。

177 Fridman and Musk, “Lex Fridman Podcast #252.”

177 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

更多资源 https://mirrorsite.org

178 Fridman and Musk, “Lex Fridman Podcast #252.”

178 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

179 Fridman and Musk, “Lex Fridman Podcast #252.”

179 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

180 Fridman and Musk, “Lex Fridman Podcast #252.”

180 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

181 Fridman and Musk, “Lex Fridman Podcast #252.”

181 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

182 Fridman and Musk, “Lex Fridman Podcast #438.”

182 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

183 “Elon Musk on Advertisers, Trust and the ‘Wild Storm’ in His Mind | DealBook Summit 2023,” New York Times Events, November 30, 2023, YouTube video, 1:33:36, https://www.youtube.com/watch?v=2BfMuHDfGJI.

183 《埃隆·马斯克谈广告商、信任与脑海中的"狂野风暴" | 交易录峰会2023》，《纽约时报》活动频道， 2023 年11 月30 日， YouTube 视频， 1:33:36 ， https://www.youtube.com/watch?v=2BfMuHDfGJI

184 “2023 Annual Shareholder Meeting,” Tesla, May 16, 2023, https://www.tesla.com/2023shareholdermeeting.

184 “2023 年度股东大会，”特斯拉，2023 年5 月16 日，https://www.tesla.com/2023shareholdermeeting。

185 “Pando Monthly Fireside Chat.”

185 “Pando月度炉边 谈话。”

更多资源 https://mirrorsite.org

PART II

第二部分

更多资源 https://mirrorsite.org

ULTRA HARDCORE WORK

极限硬核工作

To those who quietly help advance the causes we mutually believe in, knowing advancing the cause is the only reward: thank you.[186]

向默默推动我们共同信仰的事业前进的人们致敬：你们深知推动事业本身就是唯一回报，谨致由衷谢意。[186]

186 Musk (@elonmusk), X account.

186 马斯克 (@elonmusk)，X 账户

更多资源 https://mirrorsite.org

WHAT IT TAKES

成功要素

> If conventional thinking makes your mission impossible, then unconventional thinking is necessary.[187]
>
> 若传统思维令使命无解，则打破常规势在必行。[187]

更多资源 https://mirrorsite.org

TAKE RESPONSIBILITY

承担责任

> I am CEO of these companies because I feel I'm responsible for them, not because it's the best thing for my quality of life.[188]
>
> 我担任这些公司CEO，源于对其肩负的责任，而非因其能提升生活质量。[188]

I want to emphasize that sometimes—in fact, most of the time—I get way too much credit or attention for what I do. I'm just the visible element. The reason these companies are successful is because we have extremely talented people at all levels making it happen.[189]

必须强调：我的作为常获过度赞誉或关注，其实我只是显性因素。企业成功的核心在于：各级顶尖人才的通力协作成就伟业。[189]

I didn't expect to be CEO of these big companies. It just sort of happened that way.[190] It was never my intent to run Tesla. Running two companies is quite a burden. Sometimes when people think of being a CEO, they imagine granting themselves lots of vacation and doing fun things. It doesn't work that way. What you actually get as CEO is a distillation of the worst things going on in the company.[191]

I didn't expect to be CEO of these big companies. It just sort of happened that way. | 我从未打算成为这些大公司的首席执行官。事情就这样发生了。[190] 我从未想过管理特斯拉。同时管理两家公司是个相当大的负担。有时人们想到担任CEO，会幻想给自己放长假、做些有趣的事。

更多资源 https://mirrorsite.org

事实并非如此。作为CEO，你实际面对的是公司最棘手问题的浓缩。[191]

Particularly, if you're the CEO, you work on all the worst problems in the company. There's no point in spending time on things that are going right, so you only spend time on things that are going wrong. Specifically, the things other people can't fix. The most pernicious and painful problems.[192]

尤其是作为首席执行官，你必须处理公司里所有最棘手的问题。没必要在进展顺利的事务上浪费时间，你只需专注于出问题的环节。具体而言，就是其他人无法解决的、最顽固最棘手的问题。[192]

Q: How do you manage through failure?

问：如何带领团队度过失败？

Managing through big failures is painful and difficult. It feels terrible. The company looks at me to rally them, so I do. But I feel terrible. Failure is a punch in the gut. Even when you've got a lot of smart people working super hard to minimize the probability of failure, it's still there. And it's quite significant.[193]

应对重大失败是痛苦且艰难的，那种感受糟透了。公司指望我凝聚团队，所以我做到了。但我的内心依然煎熬。失败如同腹部重击。即使有众多聪明人竭尽全力降低失败概率，它依然存在。而且这相当重要。[193]

> Given the options, I prefer to learn from success.[194]
>
> 在现有选项中，我更倾向于向成功学习。[194]

更多资源 https://mirrorsite.org

EARN DEEP UNDERSTANDING

掌握深度理解

I wanted to know how the universe works and how the economy works. So, I studied physics and economics. You need to be able to bring a lot of people together to create something. It's difficult to do something as just an individual, especially for a significant technology.[195]

我想了解宇宙的运行原理和经济体系的运作机制。因此我选择了研习物理学和经济学。你需要凝聚众人之力才能创造价值。单打独斗难成大事，尤其是在重大技术领域。[195]

I was concerned if I didn't study business I would be forced to work for someone who did, because they would know special things I didn't know. I didn't like the sound of that, so I made sure I knew those things, too.[196]

我曾担忧若不修读商科，将被迫为懂行之人效力，因为他们掌握我所不知的专业知识。这绝非我所愿，所以我确保自己同样精通这些领域。[196]

Physics gave me the basics, a good analytical framework.[197] Physics was rigorous, and we learned a lot of math. Later, I was in an advanced securities analysis class in the business school, and they were teaching people matrix math. I realized if you can do physics math, then business math is super easy.[198]

Physics gave me the basics, a good analytical framework. | 物理学赋予我基础认知，构建了完善的分析框架。[197] 物理学体系严谨，我们掌握了大量数学工具。后来在商学院的高级证券分析课上，教授正在讲解矩阵数学。我意识到若能驾驭物理数学，商业数学便易如反掌。[198]

更多资源 https://mirrorsite.org

> My goals were to engineer products by having a feel for the physics and to never work for a boss with a business degree.[199]
>
> 我的目标是通过培养物理直觉来设计产品，且绝不为拥有商科学位的老板效力。[199]

One reason SpaceX could move so quickly is I made both the engineering decisions and the spending decisions together in one brain. In most companies, those decisions require at least two different people.

太空探索技术公司能如此迅速推进的原因之一，在于我将工程决策与支出决策集中于同一思维体系内完成。在多数企业，这两类决策至少需要两位不同负责人。

There's some engineering guy who's trying to convince a finance guy that this money should be spent. But the finance guy doesn't understand engineering, so he can't tell if this is a good way to spend money or not. Plus, they may not trust each other. I'm making the engineering and spending decisions together with all the information in one place. My brain trusts itself.[200]

通常是工程师试图说服财务人员批准某项开支。但财务人员不懂工程学，无法判断支出合理性，而且双方可能互不信任。我在同一思维框架下同步处理工程与支出决策，所有信息整合归一。我的大脑自成信任体系。[200]

I'm head engineer, chief designer, and CEO at SpaceX, so I don't have to cave to some money guy. I encounter CEOs who don't know the details of their technology, and that's ridiculous to me.[201]

作为太空探索技术公司的总工程师、首席设计师兼CEO，我不必向财务人员妥协。那些不了解技术细节的CEO，在我看来简直荒谬。[201]

更多资源 https://mirrorsite.org

To make the right decisions, you need to understand something at a detailed level.[202]

要做出正确决策，必须深入理解事物细节层面。[202]

更多资源 https://mirrorsite.org

SLEEP ON THE FACTORY FLOOR

睡在工厂车间

I've done many many stretches of one-hundred-hour weeks—true one-hundred-hour weeks, sleeping roughly six hours per day. I would not recommend that. That's for emergencies, not all the time.

我曾连续多周每周工作**一百小时**——真正意义上的**一百小时**工作制，每日睡眠仅六小时左右。但我不建议这样做。这只适用于紧急状态，不可作为常态。

During difficult times at Tesla I've had to do it, and sometimes at the beginning of my earliest startups I did that. I wouldn't leave the office. I would sleep under my desk and work seven days a week. Sometimes it's necessary for success, or to avoid failure.[203]

特斯拉遭遇困境时我不得不如此，早期创业阶段偶尔也会这样。那时我绝不离开办公室。直接在办公桌旁休息，一周七天连轴转。有时这是成功所需，或为规避失败。[203]

Tesla is pretty far up there in terms of work ethic, anywhere in the world. The Tesla work ethic is substantially greater than any other large car or manufacturing company in the US, that I'm aware of.[204]

论工作态度，特斯拉在全球都堪称顶尖典范。据我所知，特斯拉的工作强度远超美国任何其他大型汽车或制造公司。[204]

If there was a crisis situation, I slept on the floor. Most of the time I did not sleep in a conference room because people could not see me in the conference room—I slept on the floor in the factory. Otherwise how would people know? They wouldn't. Seeing is believing. I slept on the floor outside the conference room so they could see I was there.[205]

更多资源 https://mirrorsite.org

若遇危机状况，我直接睡在地板上。多数时间我都不在会议室休息——因为那里员工看不见我。我直接在工厂车间地板入睡。否则员工如何知晓？他们无从得知。眼见为实。我睡在会议室外的地板上，这样大家能看见我在场。[205]

When the team is being asked to work super hard, I have to be right there with them and they have to see it. If I fall asleep in the middle of the factory floor at four in the morning and wake up four hours later, they see that. They are like, “If the CEO is willing to take that level of pain, I can do it too.”[206]

当要求团队全力奋战时，我必须亲临现场并让他们看见。若凌晨四点倒在车间地面睡着，四小时后醒来时，所有员工都看在眼里。他们会想：‘既然CEO都愿承受这般艰辛，我也能做到。’[206]

It was a world of hurt. I would wake up smelling like oil and iron filings. It was rough. But I was asking people to really go all out. I can’t expect them to go all out if I’m not doing the same.[207]

那段日子充满煎熬。醒来时浑身都是机油和铁屑的味道，相当艰苦。但我要求人们全力以赴。若我自己不身体力行，便无法期望他们竭尽全力。[207]

更多资源 https://mirrorsite.org

FRONTLINE LEADERSHIP

前线领导力

Think about war. Do you want the general in some ivory tower or on the front lines? The troops fight harder if they see the general on the front lines. Nobody bleeds for the prince in the palace. Get out there on the front line. Show them that you care and that you're not in some plush office somewhere.[208]

试想战场：你希望将领高居象牙塔，还是亲临前线？将士们看到统帅身先士卒，作战自当奋勇争先。无人会为深宫里的王公流血卖命。亲赴前线坐镇展现你的关切，而非置身奢华办公室。[208]

If they see the general out on the battlefield, the troops are going to be motivated. Wherever Napoleon was, that's where his armies would be at their best. Even if I don't do anything but show up, they'll look at me and know I wasn't spending all night partying.[209]

若将士目睹统帅亲临战阵，士气必然大振。拿破仑亲临之处，便是法军战力巅峰之时。即便只是到场露面，他们见到我便知，我绝非整夜纵情享乐之人。[209]

> Never ask your troops to do something you're not willing to do.
>
> 切勿要求士兵承担你自己都不愿肩负之责。
>
> Whatever the people at the front lines are doing, I try to do it at least a few times myself.[210]

更多资源 https://mirrorsite.org

> 凡前线人员所为，我必亲身实践数次。[210]

It is my firm belief that the separation of the workplace into “executives” and “employees” does not create a good working environment. We want to create a system of equality without artificial barriers, so someone can start as a trainee and one day lead the entire company.

我坚信将职场划分为'高管'与'普通员工'的做法无法营造良好的工作环境。我们希望建立消除人为障碍的平等体系，让实习生也能在未来的某天执掌整个公司。

This is why we eliminate all special privileges of executives. Everyone has equal access to parking, eating at the same tables, and there are no management offices. I am convinced that managers should work at the forefront, in the same work environment as the entire team. Even though I run a company, I still do not have my own office and often move my workplace to the most challenging area in the factory.

正因如此，我们废除了所有高管特权。所有人享有平等的停车权利，在相同餐桌就餐，且不存在独立的管理层办公室。我确信管理者应当与整个团队处于相同的工作环境，始终坚守在最前沿。即便身为公司管理者，我仍不设个人办公室，并常将工作点转移到工厂最具挑战的区域。

Managers should always take care of their team before they take care of themselves. The supervisor is there to serve his team, not the other way round.[211]

管理者永远应将团队置于个人利益之前。管理者的职责是服务团队，而不是相反。[211]

All technical managers must have hands-on experience. For example, managers of software teams must spend at least 20 percent of their time coding. Solar roof managers must spend time on the roofs doing

更多资源 https://mirrorsite.org

installations. Otherwise, they are like a cavalry leader who can't ride a horse or a general who can't use a sword.[212]

所有技术管理者都必须具备亲自动手实践经验。例如，软件团队的管理者必须至少投入20%的时间进行编程工作。太阳能屋顶项目的管理者必须亲临屋顶参与安装工作。否则，他们就像不会骑马的骑兵队长，或是不会用剑的将军。[212]

Always be smashing your ego. Internalize responsibility. Whether you're a CEO or any other role, do whatever it takes to succeed.[213]

永远粉碎自我，内化责任。无论你是首席执行官还是其他角色，都要为成功全力以赴。[213]

A major failure mode is a high ego-to-ability ratio. If your ego-to-ability ratio gets too high, then you've broken the feedback loop to reality.[214]

一个主要的失败模式是自我-能力比率过高。若你的自我-能力比率过高，便会打破现实的反馈回路。[214]

In AI terms, you'll break your reinforcement learning (RL) loop. You want to have a strong RL loop, which means internalizing responsibility and minimizing ego.[215]

用人工智能术语来说，你将破坏自己的强化学习(RL)回路。你需要构建强大的强化学习反馈循环，这意味着要内化责任并最大限度消除自我意识。[215]

> Do whatever the task is, whether grand or humble.[216]
>
> 无论任务宏伟或平凡，都要全力以赴完成。[216]

更多资源 https://mirrorsite.org

ADVERSITY FORGES STRENGTH

逆境锻造力量

> There is a great quote from Winston Churchill: "If you're going through hell, keep going."[217]
>
> 温斯顿·丘吉尔有句名言说得好：'如果你正身处地狱，那就继续前进。'[217]

Q: Do you think overcoming challenges is something innate in your personality?

问：你认为克服挑战是你性格中的天性吗？

I was driven as a kid, very willful. One story I remember: At age six, I was grounded for some reason. I don't remember why, but I felt it was unjust. I really wanted to go to my cousin's birthday party.[218] I escaped from my nanny and walked across the city.

I was driven as a kid, very willful. One story I remember: At age six, I was grounded for some reason. I don't remember why, but I felt it was unjust. I really wanted to go to my cousin's birthday party. | 我从小就很有干劲，意志非常坚定。我记得一个故事：六岁时，我因故被禁足。虽然不记得具体原因，但当时觉得很不公平。我特别想去参加表亲的生日派对。[218] 我从保姆眼皮底下溜走，徒步穿越了整个城市。

I was just learning to read, so I could barely read the road signs. This was foolish, and something terrible could have happened. But I was so determined I walked clear across the capital city of South Africa at six years old.[219]

更多资源 https://mirrorsite.org

那时刚识字，连路牌都认不全。这很愚蠢，本可能发生可怕的事情。但凭着坚定意志，六岁的我硬是横穿了南非的首都。[219]

It was ten or twelve miles, much farther than I realized, and it took me about four hours. As my mom was leaving the party with my brother and sister, she saw me walking down the road and freaked out. So I climbed a tree and refused to come down until she promised not to punish me.[220]

那段路程长达十到十二英里，远超我的想象，花了大约四小时。当母亲带着弟弟妹妹离开派对时，看见我在路上游荡顿时大惊失色。于是我爬上树拒不下来，直到她保证不惩罚才作罢。[220]

> I seem to have a high, innate drive, and that's been true even since I was a little kid.
>
> 我似乎生来就具备强大的内在驱动力，这种特质从孩提时代便已显现。

When I was five or six, I thought I was insane. It became clear other people's minds weren't exploding with ideas all the time. I felt strange. It's hard to turn it off. It might sound great when it is on. But what if it doesn't turn off? It's like a never-ending explosion.[221]

五六岁时，我甚至以为自己精神失常了。后来才明白别人的大脑并不会时刻迸发奇思妙想，这让我感到格格不入。这种状态难以关闭。开启时固然美妙，但若永不停止呢？这就像一场永不停止的爆炸。[221]

I was the youngest kid in my grade, so I was quite small. I was kind of a smart aleck, too. It was a recipe for disaster. I'd get called every name in the book and beaten up. Being small and having violent bullies is a bad situation.[222]

更多资源 https://mirrorsite.org

我是年级里年纪最小的孩子，因此身形格外瘦小。我又有些自以为是，这种组合注定招致祸端。各种难听的外号都朝我砸来，还时常挨揍。身形瘦小又遭遇暴力欺凌，处境实在糟糕。[222]

There was a level of violence in my childhood that wouldn't be tolerated in any American school. It was like *Lord of the Flies*. There were a couple of gangs that were pretty evil, and I was one of their chosen victims. Partly because I stuck up for another kid they were relentless on, that made me a target.[223]

我童年经历的暴力程度，在美国任何学校都无法容忍。就像《蝇王》的场景。有几个相当邪恶的帮派，而我成了他们选中的受害者。部分原因是我保护了另一个被他们不断欺凌的孩子，这使我成了目标。[223]

The place where I grew up in South Africa was very violent. Fighting was normal, it was part of the culture.[224] It'll certainly toughen you up; that's for sure. I was in a lot of fights I didn't want to be in. I got beaten up really badly in a few of them. I was in real hardcore street fights, from about six to sixteen.[225]

The place where I grew up in South Africa was very violent. Fighting was normal, it was part of the culture. | 我在南非长大的地方暴力横行。打架是常态，是当地文化的一部分。[224] 这肯定会磨练你的意志；这一点毋庸置疑。我被迫卷入许多不想参与的斗殴，有几次被打得相当惨。从六岁到十六岁，我经历了真正激烈的街头搏斗。[225]

> I was almost beaten to death—within an inch of my life at one point.[226]
>
> 有次我差点被打死——仅剩一口气。[226]

I got to a reasonably good size around fifteen, and around sixteen they stopped trying to beat me up, because it didn't work out so well for them

更多资源 https://mirrorsite.org

anymore.[227]

十五岁时我体格已相当健壮，到十六岁他们就不再试图殴打我，因为这已不会让他们讨到便宜。[227]

People say they’re worried about the damage of words. People worried about words have never been punched in the face. Once you’ve been punched in the face, real hard, right on the nose—you’ll take any words over that.[228]

人们总说担心言语造成的伤害。畏惧言语的人从未被重拳击中面部。当你的鼻梁被狠狠重击之后——任何言语都比这种痛苦更易承受。[228]

> Adversity shaped me. My pain threshold became very high.[229]
>
> 逆境塑造了我。我的疼痛阈值变得极高。[229]

更多资源 https://mirrorsite.org

EAT GLASS AND STARE INTO THE ABYSS

吞玻璃与凝视深渊

> When starting a company, usually the beginning is fun.
>
> 创业初期通常充满乐趣。
>
> Then, it’s hellish for a number of years.[230]
>
> 随后数年便会如同身处地狱。[230]

You have to be focused on the short term and money coming in when creating a company, because otherwise the company will die. People think, “Oh, creating a company will be fun.” It’s not. There are periods of fun, and there are periods where it’s just awful.

创立企业时必须聚焦短期现金流，否则公司将难以为继。人们总以为'创业充满乐趣'。实则不然。虽有愉悦时刻，但更多时候堪称煎熬。

You have to feel quite compelled to start a company. You must have a high pain threshold. My friend Bill Lee says, “Starting a company is like eating glass and staring into the abyss.” There’s some truth to that.[231]

你需要有强烈的创业驱动力。必须具备极高的痛苦承受力。挚友比尔·李曾说：'创业如同吞玻璃同时凝视深渊。'此言不虚。[231]

“Staring into the abyss’” means you’re going to be constantly facing the extermination of the company. Most startups fail. It’s like 90 percent—it

更多资源 https://mirrorsite.org

could be 99 percent of startups fail. You're constantly saying, "If I don't get this right, the company will die." This can be quite stressful.[232]

"凝视深渊"意味着你将不断面对公司覆灭的威胁。绝大多数初创企业都会失败。失败率可能高达90%——甚至99%的初创企业都会倒闭。你时刻都在警醒自己："如果这次决策失误，公司就会死亡。"这种压力令人窒息。[232]

"Eating glass" means you've got to work on the problems the company needs you to work on, not the problems you want to work on. You end up working on problems you wish you *weren't* working on. That's "eating glass," and it goes on for a long time.[233]

"吃玻璃"意味着你必须解决公司亟需解决的问题，而非你感兴趣的问题。最终你不得不处理那些本不该由你操心的难题，这就是"吃玻璃"，且这种状态会持续很久。[233]

We were facing imminent death at SpaceX, Tesla, and SolarCity for a long time. We're no longer staring directly into the abyss, which is great. It is there in the distance, but I'm not staring right at it. There's always going to be some amount of glass that has to be chewed. But it's less and less as time goes by.[234]

太空探索技术公司、特斯拉和太阳城公司都曾长期濒临死亡边缘。值得庆幸的是，我们已不必直面深渊的凝视。危机虽仍在远方徘徊，但我不再与之正面对视。不过，总有些"玻璃"是必须啃下去的。但随着时间的推移，这种情况越来越少。[234]

> If you don't eat the glass, you're not going to be successful.[235]
>
> 如果你不敢'啃玻璃'，就不可能成功。[235]

更多资源 https://mirrorsite.org

Q: How do you keep your focus on the big picture when you're constantly faced with being bankrupt in a month?

问：当你不断面临一个月内破产的风险时，如何保持对大局的关注？

A very small percentage of mental energy is spent on the big picture. You know where you're generally heading, and the actual path is going to be a zigzag in that direction. You're trying not to deviate too far from the path you want to be on, but you have to, to some degree.[236]

只有极小部分精力用于思考全局。你清楚大致方向，实际路径将是朝着该方向的曲折前行。你努力不偏离既定轨道太远，但某种程度上又不得不偏离。[236]

Failure is not good. Failure is bad. But if something is important enough, then you do it, even though the risk of failure is high. My advice for somebody who wants to start a company: Bear in mind, the most likely outcome is failure. Reconcile yourself to that strong possibility, and only if you still feel compelled to, do it.[237]

失败很糟糕。失败是坏事。但如果事情足够重要，即使失败风险很高，你也要去做。给创业者的忠告：请记住，最可能的结果是失败。接受这种高可能性，只有当内心仍感到不得不做时，才付诸行动。[237]

That said, many people fear starting a company *too* much. What's the worst that could happen? You're not gonna starve to death; you're not gonna die of exposure—really, what's the worst that could happen?[238]

话虽如此，许多人过于害怕创业。最坏的结果会是什么？你不会饿死；也不会露宿街头——说真的，最坏的结果会是什么？[238]

187 Isaacson, *Elon Musk.*

187 沃尔特·艾萨克森，《埃隆 马斯克》。

188 "Bill Gates and Elon Musk," Baidu.

188 "比尔·盖茨与埃隆·马斯克"，百度。

更多资源 https://mirrorsite.org

189 “Bill Gates and Elon Musk,” Baidu.

189 “比尔·盖茨与埃隆·马斯克”，百度。

190 “Elon Musk,” Full Send Podcast.

190 《埃隆·马斯克》，播客全集 。

191 “Future of Energy & Transport,” Oxford Martin School.

191 《能源与交通的未来》，牛津马丁 学院。

192 Sal Kahn and Elon Musk, “Elon Musk: CEO of Tesla Motors and SpaceX,” Khan Academy, April 22, 2013, YouTube video, 48:41, https://www.youtube.com/watch?v=vDwzmJpI4io.

192 萨尔·可汗与埃隆·马斯克，《埃隆·马斯克：特斯拉汽车首席执行官与太空探索技术公司创始人》，可汗学院，2013年4月22日，YouTube视频，时长48:41，https://www.youtube.com/watch?v=vDwzmJpI4io。

193 “Elon Musk,” Full Send Podcast.

193 《埃隆·马斯克》，Full Send 播客

194 “Elon Musk,” Full Send Podcast.

194 《埃隆·马斯克》，Full Send 播客

195 Musk, “Caltech Commencement Speech.”

195 马斯克《加州理工学院毕业典礼 演讲》

196 Jimmy Soni, *The Founders: The Story of PayPal and the Entrepreneurs Who Shaped Silicon Valley* (Simon & Schuster, 2022).

196 吉米·索尼，《创始人：*PayPal*传奇与塑造硅谷的企业家群体》（西蒙与舒斯特出版社，2022年）。

197 “Elon Musk, Charlie Rose Interview (2009).”

197 《埃隆·马斯克接受查理·罗斯采访（2009年）》

198 Soni, *The Founders.*

198 索尼，《 创始人》

199 Isaacson, *Elon Musk.*

199 沃尔特·艾萨克森，埃隆 马斯克

200 Berger, *Liftoff.*

更多资源 https://mirrorsite.org

200 伯杰，升空

201 Carl Hoffman, “Elon Musk, the Rocket Man with a Sweet Ride,” *Smithsonian Magazine*, December 2012, https://www.smithsonianmag.com/science-nature/elon-musk-the-rocket-man-with-a-sweet-ride-136059680/.

201 卡尔·霍夫曼，《埃隆·马斯克，拥有炫酷座驾的火箭人》，《史密森尼杂志》2012年12月，https://www.smithsonianmag.com/science-nature/elon-musk-the-rocket-man-with-a-sweet-ride-136059680/

202 “Elon Musk Answers Your Questions,” SXSW 2018.

202 《埃隆·马斯克回答你的问题》，西南偏南大会 2018年

203 “Elon Musk: 10X Every 6 Months.”

203 《埃隆·马斯克：每6 个月实现十倍增长》

204 Elon Musk, “Elon Musk Commencement Speech at Caltech / CIT 2012,” YouTube video, 15:48, posted by “Elon Musk Best Videos,” November 22, 2015, .

204 埃隆·马斯克，《埃隆·马斯克加州理工学院2012年毕业典礼演讲》，YouTube视频（15:48），由“埃隆·马斯克精选视频”发布于2015年11月22日，

205 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

205 克里希南与拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》

206 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

206 克里希南与拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》

207 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

207 克里希南与拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》

208 “Elon Musk on Tesla, SpaceX and Why He Left Silicon Valley | WSJ,” The Wall Street Journal, December 9, 2020, YouTube video, 26:47, https://www.youtube.com/watch?v=V1nQFotzQMQ.

208 「埃隆·马斯克谈特斯拉、太空探索技术公司及为何离开硅谷 | WSJ」，《华尔街日报》，2020年12月9日，YouTube视频，26分47秒，https://www.youtube.com/watch?v=V1nQFotzQMQ。

209 Isaacson, *Elon Musk*.

209 沃尔特·艾萨克森，埃隆 马斯克。

210 Fridman and Musk, “Lex Fridman Podcast #438.”

210 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

更多资源 https://mirrorsite.org

211 Noah Magel, ed., *Musk's Memos: The Leaked Emails That Built an Empire* (noah@koda-labs.com, 2024).

211 诺亚·马格尔编，马斯克备忘录：泄露邮件构筑的帝国 (noah@koda-labs.com, 2024)

212 Isaacson, *Elon Musk*.

212 沃尔特·艾萨克森，埃隆 马斯克

213 "Elon Musk: Digital Superintelligence," Y Combinator.

213 "埃隆·马斯克：数字超级智能"，Y Combinator。

214 "Elon Musk: Digital Superintelligence," Y Combinator.

214 "埃隆·马斯克：数字超级智能"，Y Combinator。

215 "Elon Musk: Digital Superintelligence," Y Combinator.

215 "埃隆·马斯克：数字超级智能"，Y Combinator。

216 "Elon Musk: Digital Superintelligence," Y Combinator.

216 《埃隆·马斯克：数字超级智能》，Y Combinator。

217 Musk, Reddit AMA.

217 马斯克，Reddit 问答环节。

218 "CHM Revolutionaries: An Evening with Elon Musk."

218 《计算机历史博物馆革新者：与埃隆 ·马斯克共度夜晚》。

219 "Candid Interview with Tesla CEO," Vator.

219 "特斯拉CEO坦诚专访"，维特。

220 "CHM Revolutionaries: An Evening with Elon Musk."

220 "CHM革新者：与埃隆 马斯克的对话"。

221 Rogan and Musk, "JRE #1169."

221 罗根与马斯克，"JRE #1169"。

222 "10 Questions for Elon Musk," *TIME*, July 19, 2010, https://content.time.com/time/magazine/article/0,9171,2002512,00.html.

222 "埃隆·马斯克十问"，时代周刊，2010 年 7 月 19 日，https://content.time.com/time/magazine/article/0,9171,2002512,00.html。

223 Daum, "Elon Musk Wants to Change How Humans Live."

更多资源 https://mirrorsite.org

223 Daum，《埃隆·马斯克欲改变人类 生活方式》

224 Isaacson, *Elon Musk.*

224 沃尔特·艾萨克森，埃隆 马斯克

225 “Elon Musk,” Full Send Podcast.

225 《埃隆·马斯克专访》，全力发送 播客

226 Peterson and Musk, “Dr. Peterson x Elon Musk.”

226 彼得森与马斯克，《博士彼得森 x 埃隆 马斯克》

227 “Elon Musk,” Full Send Podcast.

227 “埃隆·马斯克，”全力播客 。

228 “Elon Musk,” Full Send Podcast.

228 “埃隆·马斯克，”全力播客 。

229 Isaacson, *Elon Musk.*

229 沃尔特·艾萨克森，埃隆 马斯克。

230 “CHM Revolutionaries: An Evening with Elon Musk.”

230 “计算机历史博物馆革新者：埃隆·马斯克之夜”

231 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

231 可汗与马斯克访谈，“特斯拉汽车首席执行官及太空探索技术公司创始人访谈”

232 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

232 可汗与马斯克访谈，“特斯拉汽车首席执行官及太空探索技术公司创始人访谈”

233 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

233 可汗与马斯克，《特斯拉汽车首席执行官兼 太空探索技术公司创始人访谈》

234 “Pando Monthly Fireside Chat.”

234 《Pando月度炉边 谈话》

235 “CHM Revolutionaries: An Evening with Elon Musk.”

235 《计算机历史博物馆革新者：与埃隆· 马斯克共度之夜》

236 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

更多资源 https://mirrorsite.org

236 可汗与马斯克，《特斯拉汽车首席执行官与 太空探索技术公司》

237 “CHM Revolutionaries: An Evening with Elon Musk.”

237 《计算机历史博物馆革新者：与埃隆· 马斯克共度的夜晚》

238 Urban, “The Cook and the Chef.”

238 厄本，《厨师与 主厨》

更多资源 https://mirrorsite.org

BUILDING EXCEPTIONAL TEAMS

打造卓越团队

The most important thing is to attract great people. Whether you are creating a company or joining a company, find an amazing group that you really respect.[239]

最重要的是吸引优秀人才。无论是创建公司还是加入公司，都要找到真正令你敬佩的杰出团队。[239]

更多资源 https://mirrorsite.org

A GROUP WITH A GOAL

目标导向的团队

A company is just a bunch of people coming together to create a product or service. There's no such thing as "a business," just a group pursuing a goal.[240]

公司就是一群人共同创造产品或服务的组织。不存在所谓的'企业'，只有追求共同目标的群体。[240]

How talented and hardworking that group is, and the degree to which they are focused cohesively in a good direction, will determine the success of the company. If you're creating a company, or if you're joining a company, the most important thing is to attract great people.[241]

团队的才能与勤奋程度，以及他们在正确方向上团结协作的专注度，将决定公司成败。无论创建还是加入公司，最关键的是吸纳顶尖人才。[241]

A company is essentially a cybernetic collective of people and machines. This collective is far smarter than an individual.[242] That's what a company is, and there are different levels of complexity in the way companies are formed.[243]

A company is essentially a cybernetic collective of people and machines. This collective is far smarter than an individual. | 公司本质上是由人与机器组成的控制论共同体。这种集体智慧远超个人能力。[242] 这就是公司的本质，其组织架构的复杂程度存在不同层级。[243]

Obviously, one person can't build a whole rocket, engines, launchpad, and everything. That's impossible. We have thousands of people at SpaceX. By piecing it out to different people and using our collection of computers,

更多资源 https://mirrorsite.org

tools, and machines we can make lots of rockets, launch them into orbit, dock with the International Space Station, and more.[244]

显然，单凭个人不可能完成整个火箭、发动机、发射台等所有系统的建造。太空探索技术公司拥有数千名员工。通过将任务分配给不同人员，并利用我们的计算机集群、工具和设备，我们能够制造大量火箭、将其发射入轨、与国际空间站对接以及完成更多任务。[244]

> People sometimes forget a company is just a group of people gathered together to make products for fellow human beings.
>
> 人们有时会忘记，公司本质上就是一群人聚集起来为人类同胞制造产品的组织。
>
> As long as they make great products, the company will have great value.[245]
>
> 只要持续产出卓越产品，公司就能创造巨大价值。[245]

To create a company, you have to convince others to join you in your effort. You have to convince them there is a reasonable chance of success and if there is success, the reward will be commensurate with the effort.

创业需要说服他人共同参与事业。必须让他人确信存在合理的成功概率，且成功后回报将与付出相匹配。

> If you’re going to create a company, the first thing you should try to do is create a working prototype.[246]

更多资源 https://mirrorsite.org

> 创立公司的首要任务，是打造一个可运作的原型。[246]

When starting a company, create a demonstration, a mock-up, or a sketch. This helps people envision it. Try to get to that point as soon as possible, then iterate to make it as real as possible as fast as possible.[247]

创业初期应创建演示模型、模拟样机或设计草图。这有助于构建产品愿景。应尽快达成此阶段目标，随后通过快速迭代使其最大限度贴近现实。[247]

It doesn’t sink in for people until you actually have a physical object they can use. Even when you can show something works on paper, and the calculations are clear, it’s not the same.[248]

除非人们亲眼见到可用的实物，否则他们不会真正理解。即便能在纸上展示可行性，计算过程再清晰，也远远不够。[248]

Anything can look good on PowerPoint. If you have an actual demonstration, even in primitive form, it is much more effective in convincing people.[249]

PPT演示可以粉饰一切。但若能提供实际演示——哪怕只是雏形——说服力将成倍提升。[249]

> Fundamentally, if you don’t have a compelling product at a compelling price, you don’t have a great company.[250]
>
> 本质上，缺乏极具吸引力的产品与价格，就不可能成就伟大的企业。[250]

更多资源 https://mirrorsite.org

CREATE A CULTURE OF BUILDERS

创建建设者文化

> I consider one of my core responsibilities as CEO is to have an environment where great engineers can flourish.[251]
>
> 我认为CEO的核心职责之一，就是营造能让杰出工程师茁壮成长的环境。[251]

I don’t think I manage smart people; they manage themselves. If someone is smart and talented, they can go anywhere and do anything, anytime.[252]

我不认为自己是在管理聪明人；他们本就擅长自我管理。真正有才华的人，随时随地都能施展抱负。[252]

I say, “Look, this is the goal we’re after. Do you agree with this goal? If you do, then let’s try to get it done.”

我会明确告知：'这就是我们的目标。你是否认同这个目标？若认同，那咱们就全力以赴实现它。'

I’ll provide my opinion along the way. But it’s rare for me to actually insist on a particular thing. Once in a while I’ll say, “You have to trust me on this one. We have to do this, and if it turns out to be a bad decision, we can all hold it against me in the future.”[253]

过程中我会提供建议，但极少强制要求具体执行方式。偶尔我会明确表态：‘这次必须相信我。我们必须这么做，如果最终证明是错误决

更多资源 https://mirrorsite.org

定，将来你们都可以追责于我。’[253]

Another important principle: You want everyone to be able to think like the chief engineer. They need to understand the system at a high level, well enough to know when they are making a bad optimization.[254]

另一个重要原则：要让每个人都具备总工程师的思维方式。他们需要从系统层面理解全局，足以判断何时在进行不当优化。[254]

Since a company is a group of people assembled to create a product or service, the ability to attract and motivate great people is critical to the success of a company. That’s the purpose of a company. People sometimes forget this elementary truth.

公司作为创造产品或服务的组织体，吸引并激励优秀人才的能力是其成功的关键。这正是企业存在的根本目的。人们时常会忽视这个基本事实。

If you’re able to get talented, hard-working people to join the company, work together, and have a relentless sense of perfection toward a common goal, you will end up with a great product. If you have a great product, lots of people will buy it, and the company will be successful.[255]

若能汇聚有才华、勤奋的员工，使其精诚合作，并对共同目标保持追求完美的不懈精神，终将缔造出卓越产品。如果你的产品足够出色，自然会吸引大量消费者，公司也将走向成功。[255]

That’s why our most important consideration is recruiting the best people. The output of any company is the vector sum of the people within it. If we attract the most talented people over time and our direction is correctly aligned, we will prevail.[256]

正因如此，我们最优先的任务是招募顶尖人才。企业的整体产出等于内部人才的向量总和。只要持续吸引顶尖人才并确保方向正确，我们终将胜出。[256]

更多资源 https://mirrorsite.org

> A small group of technically strong people will always beat a large group of moderately strong people.[257]
>
> 一支精干的技术精英团队，总能战胜规模庞大但水平中庸的群体。[257]

What you see at SpaceX is the result of an incredible team. Supertalented people who work like crazy to advance technology. They make this happen. My role is to make sure they have an environment where their talents can come to the fore. I can't tell you how honored and grateful I am to work with such a great team.[258]

太空探索技术公司今日的成就，源自这支卓越团队的集体智慧。正是这群天赋超群、全力以赴推动技术进步的精英，让这一切成为现实。我的职责是为他们创造能充分施展才华的环境。能与如此杰出的团队共事，我的荣幸与感激之情难以言表。[258]

> Do everything you can to gather great people.[259]
>
> 竭尽所能网罗顶尖人才。[259]

Many companies suppress their talented, driven engineers. Some are suppressed by being so comfortable they don't produce much. There are a few places in Silicon Valley with good engineers—but what are they producing? The output of that engineering talent seems low, though maybe they are enjoying themselves.

许多企业都在压制那些才华横溢、充满干劲的工程师。有些人才因环境过于安逸而丧失产出效率。硅谷确有寥寥无几的工程师精英聚集地

更多资源 https://mirrorsite.org

——但他们的产出成果究竟如何？不过他们的工程人才产出似乎偏低，也许他们正自得其乐。

Tesla is not like that. We're demanding. You're going to get a lot done and it's going to be cool work, but it's not going to be easy. At Tesla, a superb engineer's talents are used to a greater degree than anywhere else.[260]

特斯拉不同，我们要求严苛。你将成就斐然，参与酷炫工作，但这绝非易事。在特斯拉，顶尖工程师的才能能得到比其他地方更充分的施展。[260]

Tesla has been like a whole series of startups. So far almost all have been quite successful, so we must be doing something right.[261]

特斯拉如同经历了一系列初创企业的蜕变。迄今多数项目相当成功，可见我们必有可取之处。[261]

> Only exceptional performance constitutes a passing grade.[262]
>
> 唯有卓越表现才算及格。[262]

更多资源 https://mirrorsite.org

RECRUIT FOR EXCEPTIONAL ABILITY

招募卓越才能

> When hiring, I look for evidence of exceptional ability, or at least exceptional aspiration.
>
> 招聘时，我寻求卓越能力的证明，或至少是卓越的抱负。

Sometimes these things get messed up in recruiting. I sometimes wonder, “If Nikola Tesla applied to Tesla, would we even give him an interview?” It’s not clear. They might say, “This guy came from some weird college in Eastern Europe, he’s got some odd mannerisms, we don’t know if we should give him an interview.” I worry that’s what we’d do. Our response should be, “Man, Nikola Tesla, this kid’s super smart. What does he want? We’ll pay him anything!”[263]

招聘流程有时会错失良才。我常想：'如果尼古拉·特斯拉应聘特斯拉，我们能给他面试机会吗？'答案未可知。他们或许会说：'这人来自东欧的野鸡大学，举止怪异，不确定该不该面试。'我担忧这正是我们的反应。而正确回应应是：'天啊！尼古拉·特斯拉！这年轻人绝顶聪明！他想要什么？我们不惜一切代价！'[263]

I always ask my teams to give a lot of thought to who should join. I recommend paying close attention to people who haven’t completed their grad or even undergrad, but are obviously brilliant. Better to have them join before they achieve a breakthrough.[264]

我总是要求团队深入思考应该招募哪些人才加入。我建议重点关注那些未完成研究生甚至本科学业，但天赋异禀的人才。最好在他们取得

更多资源 https://mirrorsite.org

重大突破前招揽其加入。[264]

You've got to be willing to recruit hard for excellent people. When I was interviewing Bülent Altan for SpaceX, I told him, "I heard you don't want to move to Los Angeles because your wife works for Google in San Francisco. Well, I just talked to Larry Page, and they're going to transfer your wife down to LA. So what are you going to do now?" He said he would come work for SpaceX.[265]

你必须愿意为招募顶尖人才付出不懈努力。我在太空探索技术公司面试布伦特·阿尔坦时告诉他："听说你因妻子在旧金山谷歌工作不愿搬来洛杉矶？我刚和拉里·佩奇谈过，他们准备将你妻子调任至洛杉矶分部。现在你作何打算？"他当即表示愿意加入我们。[265]

I have a great ability to tell if someone is a good engineer or not. And I am good at optimizing the efficiency of an engineering team. It helps that I'm quite good at engineering in general.[266]

我具备精准识别优秀工程师的非凡能力，并擅长优化工程团队的工作效率。这得益于我在工程学领域普遍具备出色的专业能力。[266]

In interviews, I ask people to tell me the story of their career and some of the tougher problems they dealt with, how they dealt with those, and how they made decisions at key transition points. Usually that's enough for me to get a good gut feeling about someone. What I'm really looking for is evidence of exceptional ability. Did they face difficult problems and overcome them?

面试时，我会要求应聘者讲述职业经历，重点了解他们处理过的棘手难题、应对策略及关键转折点的决策过程。这通常足以让我对某人形成准确的直觉判断。我真正寻求的是卓越能力的实证。他们是否曾直面艰巨挑战并成功攻克？

Usually the person who had to struggle with the problem really understands it and they don't forget if it was difficult. Ask them detailed questions about

更多资源 https://mirrorsite.org

it, and they’ll know the answers. A person who was not responsible for that accomplishment will not know the details.[267]

通常亲身经历难题的人才能真正理解问题本质，且对艰难过程记忆深刻。深入追问细节，他们必能对答如流。非实际执行者无法掌握具体细节。[267]

更多资源 https://mirrorsite.org

RETAIN ONLY SPECIAL FORCES

只保留特种部队

I worked very hard to collect the right expertise when starting SpaceX. I tried hard to find a great chief engineer for the rocket, but good chief engineers wouldn't join and there is no point in hiring the bad ones. I ended up being chief engineer of the rocket. If I could have found somebody better, maybe we would have had fewer than three failures.[268]

创办太空探索技术公司时，我倾尽全力组建专业团队。为寻找优秀火箭总工程师竭尽全力，但顶尖人才不愿加盟，平庸之辈又毫无价值。最终我亲自担任了火箭总工程师。若能找到更合适人选，或许我们的失败次数会少于三次。[268]

> Wherever the smartest, most driven people are choosing to work, that company is going to win.[269]
>
> 最聪明、最有干劲的人才流向何处，何处便是赢家。[269]

My philosophy for companies in the startup phase is a "Special Forces" approach. The minimum passing grade is excellent. I believe that's the culture companies need to have if they're going to become successful.[270]

我对初创阶段企业秉持'特种部队'式管理哲学。最低达标标准是卓越。这恰是企业获得成功必须培育的文化内核。[270]

Q: Is building great teams and products just a question of being well funded?

更多资源 https://mirrorsite.org

问：打造顶尖团队和产品是否仅取决于资金充裕？

It’s not like if we just had more money we could spend it effectively on R&D. That’s not how it works. If there was a factory producing excellent engineers, that would be true. Except this factory doesn’t exist. It’s incredibly difficult to find the right talent, integrate them into an organization, and have it work effectively. Money is not the constraint.

并非资金充裕就能高效投入研发，实际运作远非如此简单。若存在量产卓越工程师的工厂，此说方成立。可惜这样的工厂并不存在。寻觅顶尖人才、融入组织体系并实现高效运作，每一步都极具挑战。资金从来不是核心制约因素。

There are only a small number of excellent people, and they’re hard to find. Engineers especially.[271] At the end of the day, the competitiveness of any company is a function of the most talented and driven people. That is the team that’s going to win.[272]

There are only a small number of excellent people, and they’re hard to find. Engineers especially. | 卓越人才本就稀缺难寻，工程师群体尤甚。[271] 企业竞争力的本质，终将归结于顶尖人才的质量与驱动力。唯有人才云集的团队方能决胜。[272]

> The fundamental limitation is exceptional engineers. There are not that many.[273]
>
> 根本瓶颈在于卓越工程师的稀缺性——这类人才本就凤毛麟角。[273]

Having a strong sense of purpose will attract the very best talent in the world. If the work is enjoyable, the financial rewards are good, *and* the product will change the world—that’s a pretty powerful set of motivators.[274]

更多资源 https://mirrorsite.org

强烈的目标感将吸引全球顶尖人才。如果工作令人愉悦、薪酬回报丰厚，而且产品能改变世界——这便是极其强大的激励组合。[274]

I've made several hiring decisions where I valued intellect over heart and I think that was a mistake. I have tried to adjust accordingly. It matters whether somebody is a good person.[275]

我曾多次在招聘决策中重视智力高于品性，现在想来实属失误。我已尝试做出相应调整。人品是否正直至关重要。[275]

One test for assessing someone's character is to look at the character of their friends and associates. While people can put up a mask themselves for their character, their friends and associates will not. You can judge a person's character by their associates and to some degree by their enemies. If evil people hate you, you might be doing something right.[276]

评估品性的一种方法是观察其朋友及交往对象的品性。虽然人们可以伪装自己的品性，但其朋友和交往对象不会伪装。通过交往对象可判断其人品，某种程度上通过其敌对者亦可判断。若遭恶人憎恨，或许说明你正行正确之事。[276]

When hiring, look for people with the right attitude. Skills can be taught. Attitude changes require a brain transplant.

招聘时需寻觅心态端正者，技能可以后天培养。改变心态无异于实施大脑移植。

更多资源 https://mirrorsite.org

FEEDBACK OVER FEELINGS

反馈高于感受

> Physics does not care about hurt feelings. It cares about whether you got the rocket right.[277]
>
> 物理学不在乎受伤的感情。它只在乎你是否把火箭设计正确。[277]

All bad news should be given loudly and often. Good news can be said quietly and once.[278]

所有坏消息都应大声且频繁地传达。好消息只需轻声说一次足矣。[278]

I give people hardcore feedback, but I try to always focus on the substance of the discussion. I try to criticize the action, not the person. We all make mistakes. What matters is whether a person has a good feedback loop, can seek criticism from others, and can improve.[279]

我会给出硬核反馈，但始终聚焦于讨论的实质内容。我尽量批评行为而非个人，毕竟人人都会犯错。关键在于个人是否拥有良好的反馈回路，能否主动寻求批评并持续改进。[279]

It’s not your job to make people on your team love you. In fact, that’s counterproductive. I had a manager who would not fire anyone. I told him, “You can’t tell people they have to get their shit together, and when they don’t get their shit together—nothing happens to them.”

让团队成员喜欢你并非你的职责，这反而适得其反。我曾有位从不解雇下属的经理。我告诉他：'你不能光要求别人整顿好自己的事情，而

更多资源 https://mirrorsite.org

当他们毫无改进时却毫无后果。'

Camaraderie is dangerous. It makes it hard for people to challenge each other's work. There is a tendency to not want to throw a colleague under the bus. That needs to be avoided.

情谊很危险。它使人难以质疑彼此的工作成果。人们总倾向于避免让同事背黑锅，这种心态必须杜绝。

Wanting to be everyone's friend leads you to care too much about the emotions of the individual in front of you rather than caring about the success of the whole enterprise. Focusing on that one individual can lead to a far greater number of people being hurt.[280]

渴望成为所有人的朋友，会让你过分关注眼前个体的情绪，而非企业整体的成功。专注于单一个体可能导致更多人受到伤害。[280]

> I think it's a real weakness to want to be liked. A real weakness.
>
> 我认为渴望被喜欢是真正的弱点，一个真正的弱点。
>
> And I do not have that.[281]
>
> 而我身上没有这种弱点。[281]

239 Magel, ed., *Musk's Memos*.

239 马格尔编，《马斯克的 备忘录》。

240 Tim Urban, "How (and Why) SpaceX Will Colonize Mars: Part 2," *Wait But Why* (blog), August 16, 2015, https://waitbutwhy.com/2015/08/how-and-why-spacex-will-colonize-mars.html/2.

更多资源 https://mirrorsite.org

240 蒂姆·厄本，《SpaceX将如何（及为何）殖民火星：第二部分》，《等等，但为什么》博客（2015年8月16日），https://waitbutwhy.com/2015/08/how-and-why-spacex-will-colonize-mars.html/2。

241 Urban, “SpaceX Will Colonize Mars, Part 2.”

241 厄本，《太空探索技术公司将殖民火星，部件 2》。

242 Rogan and Musk, “JRE #1470.”

242 罗根与马斯克，《JRE第1470期》。

243 Rogan and Musk, “JRE #1169.”

243 罗根与马斯克，《JRE第1169期》。

244 Rogan and Musk, “JRE #1470.”

244 罗根与马斯克，《JRE第1470期》。

245 Musk (@elonmusk), X account.

245 马斯克 (@elonmusk)，X 账号。

246 Musk, “Caltech Commencement Speech.”

246 马斯克，《加州理工学院毕业典礼 演讲》。

247 “CHM Revolutionaries: An Evening with Elon Musk.”

247 《计算机历史博物馆革新者：与埃隆· 马斯克共度之夜》。

248 Musk, “Caltech Commencement Speech.”

248 马斯克，《加州理工学院毕业典礼演讲》

249 Musk, “Caltech Commencement Speech.”

249 马斯克，《加州理工学院毕业典礼演讲》

250 “Elon Musk Talks About His Firing as PayPal CEO 2008,” Inc. 5000 Conference, Elon Musk Best Videos, December 4, 2015, YouTube video, 24:50, https://www.youtube.com/watch?v=9e4AaXzagfc.

250 《埃隆·马斯克谈2008年被PayPal解雇CEO职务》，Inc. 5000会议，埃隆·马斯克最佳视频集，2015年12月4日，YouTube视频，24分50秒，https://www.youtube.com/watch?v=9e4AaXzagfc

251 “Tesla AI Day 2022.”

251 “2022年特斯拉AI日 。”

更多资源 https://mirrorsite.org

252 “Elon Musk: 10X Every 6 Months.”

252 “埃隆·马斯克：每六个月实现 十倍增长。”

253 “Elon Musk: 10X Every 6 Months.”

253 “埃隆·马斯克：每六个月实现 十倍增长。”

254 Tim Dodd, “Starbase Tour with Elon Musk [PART 1 // Summer 2021],” Everyday Astronaut, August 3, 2021, YouTube video, 53:16, https://www.youtube.com/watch?v=t705r8ICkRw.

254 蒂姆·多德，《与埃隆·马斯克同游星舰基地 [第1部分 // 2021年夏季]》，每日宇航员，2021年8月3日，YouTube视频，53分16秒，https://www.youtube.com/watch?v=t705r8ICkRw。

255 “Tesla CEO Elon Musk,” *Auto Bild*.

255 “特斯拉CEO埃隆·马斯克”，汽车 画报。

256 Magel, ed., *Musk's Memos*.

256 马格尔编，马斯克的 备忘录。

257 Jennifer Reingold, “Hondas in Space,” *Fast Company*, February 1, 2005, https://www.fastcompany.com/52065/hondas-space.

257 詹妮弗·莱因戈尔德，《太空中的本田》，《快公司》，2005年2月1日，https://www.fastcompany.com/52065/hondas-space。

258 “Elon Musk Answers Your Questions,” SXSW 2018.

258 《埃隆·马斯克回答你的问题》，西南偏南大会2018。

259 “Musk USC Commencement Speech.”

259 《马斯克南加州大学毕业典礼演讲》。

260 “Tesla AI Day 2022.”

260 《特斯拉人工智能日2022》。

261 “Tesla AI Day 2022.”

261 “特斯拉AI日 2022”

262 Magel, ed., *Musk's Memos*.

262 马格尔 编，马斯克的 备忘录

263 “Elon Musk: 2020 Mars Society Virtual Convention,” The Mars Society, October 16, 2020, YouTube video, 56:48, https://www.youtube.com/watch?v=y5Aw6WG4Dww.

更多资源 https://mirrorsite.org

263 “埃隆·马斯克：2020火星协会虚拟大会”，火星协会，2020年10月16日，YouTube视频，56:48，https://www.youtube.com/watch?v=y5Aw6WG4Dww

264 Magel, ed., *Musk's Memos*.

264 马格尔编，《马斯克的 备忘录》。

265 Berger, *Liftoff*.

265 伯杰，《升空》。

266 Berger, *Liftoff*.

266 伯杰，《升空》。

267 “Tesla CEO Elon Musk,” *Auto Bild*.

267 “特斯拉CEO埃隆·马斯克，”汽车 画报。

268 “Elon Musk Answers Your Questions,” SXSW 2018.

268 “埃隆·马斯克答网友问，”西南偏南大会 2018。

269 “2023 Annual Shareholder Meeting,” Tesla.

269 “2023年度股东大会，”特斯拉。

270 Battelle and Musk, “Web 2.0 Summit 08.”

270 巴特尔与马斯克，《Web 2.0峰会 08》

271 “Third Row Tesla Podcast, Episode 7.”

271 《特斯拉第三排播客，第 7期》

272 “2023 Annual Shareholder Meeting,” Tesla.

272 《2023年度股东大会》，特斯拉

273 “Third Row Tesla Podcast, Episode 7.”

273 《特斯拉第三排播客，第 7期》

274 “Elon Musk's Vision for the Future.”

274 “埃隆·马斯克的未来愿景”

275 “Jeff Skoll Talks with Elon and Kimbal Musk.”

275 “杰夫·斯科尔对话埃隆与金巴尔·马斯克”

276 Peterson and Musk, “Dr. Peterson x Elon Musk.”

更多资源 https://mirrorsite.org

276 彼得森与马斯克，《博士彼得森 x 埃隆 马斯克》

277 Isaacson, *Elon Musk*.

277 沃尔特·艾萨克森，《埃隆 马斯克》。

278 Isaacson, *Elon Musk*.

278 沃尔特·艾萨克森，《埃隆 马斯克》。

279 Isaacson, *Elon Musk*.

279 沃尔特·艾萨克森，《埃隆 马斯克》。

280 Magel, ed., *Musk's Memos*.

280 马格尔编，《马斯克的 备忘录》。

281 “Elon Musk on Advertisers,” DealBook Summit 2023.

281 《埃隆·马斯克谈广告客户》，2023年交易书峰会

更多资源 https://mirrorsite.org

DESIGNING THE ORGANIZATION

设计组织架构

> It must be okay for people to talk directly and make the right thing happen.[282]
>
> 必须允许员工直接沟通并促成正确的事情发生。[282]

更多资源 https://mirrorsite.org

REMOVE ORGANIZATIONAL BOUNDARIES

破除组织壁垒

> In any product, you can see the errors in the organization’s structure. They will manifest themselves in the product.
>
> 任何产品都会暴露组织结构中的缺陷这些缺陷必然在产品中显现

A major source of issues is poor communication between departments. The way to solve this is to allow free flow of information between all levels.

部门间沟通不畅是问题的主要根源解决之道在于实现信息在各级间的自由流动

There are two schools of thought about how information should flow within companies. The most common way is chain of command. That means you always flow communication through your manager. The problem with this approach is that, while it serves to enhance the power of the manager, it fails to serve the company.

关于公司内部信息流通存在两种理念最常见的是指挥链模式即所有沟通必须通过直属经理中转这种模式虽强化了经理权限，却损害了公司利益

If, in order to get something done between departments, an individual contributor has to talk to their manager, who talks to a director, who talks to a VP, who talks to another VP, who talks to a director, who talks to a manager, who talks to someone doing the actual work, then superdumb

更多资源 https://mirrorsite.org

things will happen. Then the info has to flow back the other way again. This is incredibly dumb.

若跨部门协作需基层员工→经理→总监→副总裁→另一副总裁→总监→经理→执行者七级传递信息还需原路反馈，这简直愚蠢至极

Problems get solved quickly when a person just talks to a person in another department and makes the right thing happen. Anyone can and should talk to anyone else according to what they think is the fastest way to solve a problem for the benefit of the whole company. You can talk to your manager's manager without his permission. You can talk directly to a VP in another department. You can talk to me.

当跨部门人员直接沟通促成正确决策时，问题便能迎刃而解。只要能为公司整体利益最快解决问题，任何人皆可且应当与任意同事直接沟通。你无需上级批准即可越级汇报。可跨部门直接对话副总裁，亦可直接向我汇报。

Communication should travel via the shortest path necessary to get the job done, not through the "chain of command."

沟通应沿最短路径实现目标，而非拘泥于'指挥链'。

> Any manager who attempts to enforce "chain of command" communication will soon find themselves working elsewhere.[283]
>
> 强推'指挥链'沟通模式的管理者，终将被淘汰出局。[283]
>
> You can talk to anyone without anyone else's permission. Moreover, you should consider yourself obligated to do so until the right thing happens.

更多资源 https://mirrorsite.org

> 沟通权不受层级限制，无需他人批准。更应主动担责，直至达成正确结果。
>
> Always view yourself as working for the good of the company and never your department.[284]
>
> 始终以公司全局利益为行动准则，勿陷部门本位主义。[284]

How can it possibly help Tesla for departments to erect barriers between themselves or see their success as relative within the company instead of collective? We are all in the same boat.

部门间相互设障或将内部成功视为零和博弈，何益于特斯拉？我们命运与共。

Managers should work hard to ensure they are not creating silos within the company that create an us-versus-them mentality or impede communication in any way. This is a natural tendency and needs to be actively fought.[285]

管理者应当努力避免在公司内部形成孤岛，防止滋生我们-他们的对立心态或以任何方式阻碍沟通。这是自然倾向，必须积极抵制。[285]

> The point is ensuring we execute ultrafast and well.[286]
>
> 关键在于确保我们以超高速且高质量的方式执行任务。[286]

Q: How do boundaries between departments affect product development?

问：部门间的壁垒如何影响产品开发？

更多资源 https://mirrorsite.org

You can see the organizational boundaries in the product. You'll often get a box in a box. You realize, "Why is this thing in two boxes?" Turns out, because both teams thought they needed an enclosure, the product ends up with an enclosure in an enclosure.

你可以在产品中看到组织边界的痕迹。你常会见到盒中盒的设计。你会疑惑：'为何这个部件要装在双层盒子里？'结果发现，因为两个团队都认为自己需要外壳，最终产品就出现了外壳套外壳的结构。

One case from the Tesla Model 3: The battery pack had a top enclosure and the car also has an underbody, right above it. What's the point of that? That doesn't make any sense, but because one team enclosed the battery pack and another team wanted to have an enclosed body, it happened.

以特斯拉车型3为例：电池组配有顶部外壳，而车辆底部结构恰好位于其上方。这有何实际意义？这完全不合逻辑，但由于电池组团队做了封装，车身团队又要求封闭结构，于是出现了这种情况。

It makes sense from an individual team's perspective, but you don't need a cover on the battery—there's a car on top of it. Putting the cover on the battery pack adds mass and cost, so it should be deleted.

从单个团队的角度看这很合理，但电池不需要额外盖板——车体已覆盖其上。加装电池包盖板会增加重量和成本，因此应当取消。

> Find the design necessity of every part and every process.[287]
>
> 为每个部件和每道工序确立设计必要性。[287]

Occasionally something seems necessary at the design level but turns out unnecessary in manufacturing. Connect designers and manufacturers to make sure they communicate often. The people on the assembly line should

更多资源 https://mirrorsite.org

be able to immediately grab a designer or engineer and say, “WHY DID YOU MAKE IT THIS WAY!?”"

某些设计看似必需，却可能在制造环节证明多余。建立设计师与制造商的紧密联系，确保双方频繁沟通。装配线工人应能立即找到设计师或工程师质问：‘你为什么设计成这样！’

If your hand is on a stove and it gets hot, you pull it right off. But if it’s someone else’s hand on the stove, it will take you longer to do something about it.[288]

若你的手放在炉上发烫，会立刻抽回；但若是别人的手在炉上，你的反应就会迟缓。[288]

You cannot separate design, engineering, and manufacturing. They need to be together because you are going to make mistakes. You want to identify and fix those mistakes today, right now. And if you separate them, the mistakes will fester. Let the manufacturers put the designers’ hands on the stove too.[289]

设计、工程学与制造三者不可分割。三者必须紧密结合，因为错误在所难免。必须当下立即发现并修正错误。若将其分离，错误将不断恶化。让制造者也促使设计师亲临一线。[289]

Whenever there are problems to solve, don’t just meet with your managers. Do a skip level, where you meet with the level right below your managers.

遇到问题时，切勿仅与管理层会商。实施跨级面谈，直接接触管理层下级人员。

> Physically go to where the problem is, immediately.[290]
>
> 立即亲赴问题现场。[290]

更多资源 https://mirrorsite.org

One of my rules is “Go as close to the source as possible.”

我的核心准则之一是'直抵问题源头'。

We were trying to determine how thick Starship’s walls should be. Rather than only talking to the company’s executives, I talked to some of the workers actually doing the welding. I asked what they thought was safe. The line workers thought the tank walls could get as thin as 4.8 millimeters.

在确定星舰舱壁厚度时，我不仅咨询高管，更直接与焊接工人交流。我征询他们的安全评估意见。产线工人认为舱壁厚度可减至4.8毫米。

“What about four?” I asked.

我追问：'四毫米可行吗？'

“That would make us pretty nervous,” the workers replied.

工人回应：'这会让团队感到忐忑。'

“Okay,” I said, “Let’s try four millimeters.”

我决策：'好，就试四毫米方案。'

It worked.[291]

最终验证可行。[291]

更多资源 https://mirrorsite.org

SIMPLE COMMUNICATION

简化沟通

Don’t use acronyms or nonsense words for objects, software, or processes. In general, anything that requires an explanation inhibits communication. We don’t want people to have to memorize a glossary just to function.

严禁对设备、软件或流程使用缩略语或生造词汇。通常而言，任何需要额外解释的内容都会阻碍有效沟通。我们不希望员工必须死记硬背术语表才能开展工作。

I noticed a creeping tendency to use made-up acronyms at SpaceX and Tesla. Excessive use of made-up acronyms is a significant impediment to communication, and keeping communication clear as we grow is incredibly important.

我注意到太空探索技术公司和特斯拉内部开始蔓延使用生造缩略词的趋势。过度使用生造缩略词会严重阻碍沟通，而在公司发展过程中保持沟通清晰至关重要。

A few acronyms here and there may not seem so bad, but if a thousand people are making these up, over time the result will be a huge glossary that we have to issue to new employees. No one actually remembers all these acronyms, and people don’t want to seem dumb in a meeting, so they just sit there in ignorance.

零星出现的缩略词看似无伤大雅，但如果上千人都在生造新词，长期积累将形成庞大的术语库，迫使我们必须向新员工发放术语手册。实际上没人能记住所有缩略词，员工也不愿在会议上暴露无知，最终只能在无知中干坐着。

更多资源 https://mirrorsite.org

I told people the acronyms needed to stop immediately or I would take drastic action. Unless an acronym is approved by me, it should not enter the SpaceX glossary. If there is an existing acronym that cannot reasonably be justified, it should be eliminated.

我已明确要求立即停止使用这类缩略词，否则将采取严厉措施。除非缩写词经我本人批准，否则不得列入太空探索技术公司术语表。现有缩写词若无法合理论证其存在必要性，则应予以废除。

The key test for an acronym is to ask whether it helps or hurts communication. An acronym that most engineers outside of SpaceX already know, such as GUI (graphical user interface), is fine to use. It is also okay to use a few acronyms or contractions every now and again, assuming I have approved them. For example, we use MVac and M9 instead of Merlin 1C-Vacuum or Merlin 1C-Sea Level. But they need to be kept to a minimum.[292]

检验缩写词的关键标准是：它究竟促进还是阻碍了沟通效率。太空探索技术公司外部工程师普遍知晓的缩写词（如GUI图形用户界面）可以使用。经我批准的少数缩写词或缩略语也可极偶尔使用。例如我们用MVac和M9替代Merlin 1C-真空版或Merlin 1C-海平面版。但此类缩写必须控制在最低限度。[292]

> The most simple, straightforward, low-ego terms are generally best. You want to close the loop on reality hard.[293]
>
> 最简洁、直白、谦逊的表述通常才是最佳选择。必须全力实现现实闭环。[293]

更多资源 https://mirrorsite.org

INNOVATION NEEDS PERMISSION TO FAIL

创新必须允许失败

> Failure is essentially irrelevant unless it is catastrophic.[294]
>
> 失败本质上无关紧要，除非是灾难性的。[294]

更多资源 https://mirrorsite.org

失败本质上无足轻重
除非其具有毁灭性

You have to always look at the incentive structure of an organization and ask, “Is that organization properly incentivizing innovation?”[295] We’re looking for any possible action that can improve the probability of success, no matter how small. Whether that comes from an intern, me, or anyone else doesn’t matter.[296]

You have to always look at the incentive structure of an organization and ask, “Is that organization properly incentivizing innovation?” | 必须审视组织的激励结构并自问：「该机制是否有效激励创新？」[295] 我们寻求任

更多资源 https://mirrorsite.org

何能提高成功概率的行动，无论其影响多么微小。无论建议来自实习生、我本人或其他人，皆同等重要。[296]

When trying new things, you've got to have some acceptance of failure… failure must be an option. If failure is not an option, it's going to result in extremely conservative choices and you may get something even worse than lack of innovation—things may go backward.[297]

尝试新事物时，必须对失败有所包容……失败必须是可接受的选项。若不允许失败，将导致极端保守的决策，结果可能比缺乏创新更糟——甚至出现倒退。[297]

When we had early failures in the SpaceX flights, I didn't fire anyone responsible for those particular causes of failure. They could have made better decisions, but they were smart and hardworking. It just wouldn't have been fair in that situation. Letting people go is only fair if they can't get themselves motivated around the core mission or they're really not giving it everything they can.[298]

太空探索技术公司早期火箭发射失败时，我并未解雇相关责任人。他们本可做出更佳决策，但其才智与勤勉毋庸置疑。在当时情境下，追责有失公允。若员工无法围绕核心使命自我激励，或未能全力以赴，请其离开方为公平之举。[298]

It's important to create an environment that fosters innovation, and you want to let it evolve in a Darwinian way. You don't want to pick one technology or path and decide that it will win, because it may not be the best option. Let things evolve.[299]

营造促进创新的环境至关重要，应任其遵循达尔文式演化。切忌预先选定技术路线并断言必胜，因其未必是最优解。[299]

With innovation and new technology, you don't know what the path is—there's no map. By nature it's unknown, which means you're going to make false moves. It must be culturally acceptable to make false moves.[300]

更多资源 https://mirrorsite.org

创新与新技术探索本无既定路径——如同没有地图指引。其本质充满未知，这意味着必然出现方向性失误。必须构建允许试错失误的文化环境。[300]

So to provide support for innovation, make sure the penalty for failure is low. You don't want the response to failure to be too punitive. That's one of the keys to Silicon Valley's success. There are many founders who've built successful companies after a previous company failed. They quickly reconstituted. People left and joined other companies. That's critical.[301]

因此支持创新需确保失败成本可控，切忌采取过度惩罚性措施。此乃硅谷成功的关键要素之一。众多创始人在首次创业失败后，最终成功缔造了卓越企业。他们迅速重整旗鼓。人才流动加入其他公司，此点尤为关键。[301]

If you punish people too much for failure, then they will respond accordingly, and the innovation you get will be incremental. Nobody's going to try anything bold for fear of getting fired or being punished in some way. If you expect innovation, the compensation structure must reflect that. The risk-reward must favor taking bold moves.[302]

若对失败惩罚过重，人们便会相应调整行为，此时获得的创新只能是渐进式的。无人敢于尝试大胆举措，唯恐被解雇或遭受其他惩罚。若要激发创新，薪酬结构必须体现这一导向。风险-回报必须倾向于采取大胆行动。[302]

Failure is a side effect of iteration. I once told a discouraged engineer, "If you can't tell me the four ways you fucked something up before you got it right, you weren't the one doing the real work."[303]

失败是迭代过程中的必然产物。我曾告诫一位气馁的工程师："若在成功前说不出搞砸过的四件事，就证明你未曾亲历实质工作。"[303]

更多资源 https://mirrorsite.org

> If we're not occasionally blowing up an engine on the test stand, we're not trying hard enough.[304]
>
> 若测试台上未曾偶尔炸毁发动机，说明我们尝试得不够努力。[304]

Q: Why is it so hard to predict what will work and what won't?

问：为何如此难以预判方案的可行性？

We do as much as we can on the ground and in simulations, but a lot of factors can't be simulated. A design might work in simulation or the test stand, but not in a real flight.[305] There's no test stand that can test a rocket at 17,000 mph, doing six Gs in every different orientation. It's not possible.[306]

We do as much as we can on the ground and in simulations, but a lot of factors can't be simulated. A design might work in simulation or the test stand, but not in a real flight. | 我们尽可能在地面及模拟环境中测试，但诸多因素无法模拟。设计在模拟环境或测试台可能有效，但在实际飞行中却未必可行。[305] 世界上没有测试台能在17,000英里每小时的速度下测试火箭，同时承受六个重力加速度的任意方向冲击。这根本不可能实现。[306]

After we fly a mission, hundreds of changes take place. Not a few. Hundreds. If you go to a detailed level across the ship, booster, and engines, there might be thousands of changes between flights. I'm just talking hardware here; software changes even more.[307]

每次飞行任务结束后，我们都会实施数百项改进。不是少数，而是数百项。如果详细考察飞船、助推器和发动机的每个层面，两次飞行间的改进可能多达数千处。这里仅讨论硬件方面；软件的变动频率甚至更高。[307]

更多资源 https://mirrorsite.org

Many are small, but a small change could be a big deal. The first issues you find are fundamental design flaws that would make success impossible. Some issues vary. They make success possible sometimes, but not every time. Maybe a design will blow up only once in a while. Things that work only sometimes can throw you off. Just because it worked once does not mean it will work again, because the combination of factors isn't the same. It requires a lot of flights to figure out which issues cause one in ten failures and which cause one in one hundred failures.[308]

多数改进看似微小，但细微调整可能带来重大影响。最初发现的往往是导致任务根本不可能成功的基础设计缺陷。有些问题则具有波动性。它们有时能促成成功，但并非每次都能奏效。某些设计可能仅会偶尔导致爆炸。时灵时不灵的特性最易误导判断。成功一次绝不代表能复制成功，因为要素组合永远不会完全相同。需要大量飞行数据才能甄别：哪些问题导致十分之一故障率，哪些仅引发百分之一故障率。[308]

You will lose.

你终将失败。

It will hurt the first fifty times.

前五十次都会很痛苦。

When you get used to losing, you will play each game with less emotion.[309]

当你习惯失败后，每次博弈的情绪会更少。[309]

更多资源 https://mirrorsite.org

SIMPLICITY WINS

简约制胜

> Never use a cruise missile to kill a fly; just use a flyswatter.[310]
>
> 切勿用巡航导弹拍苍蝇，蝇拍足矣。[310]

Every decision we made in early SpaceX designs has been with simplicity in mind. Simplicity both improves reliability and reduces cost. Fewer components means fewer components to buy and fewer components that can go wrong.[311]

太空探索技术公司早期设计中的每个决策都秉持简单性原则。简约设计既提升可靠性又降低成本。部件越少意味着采购量越少，故障点也越少。[311]

The number of lines of code is not a figure of merit. I consider a large number of lines of code to be bad, not good. I would award one point for adding a line of code and two points for deleting a line of code.[312]

代码行数绝非衡量标准。我认为大量代码行数是弊端而非优势。新增一行代码得一分，删除一行代码得两分。[312]

In general, always pick common sense as your guide. If following a “company rule” is obviously ridiculous in a particular situation, such that it would make for a great *Dilbert* cartoon, then the rule should change.[313]

更多资源 https://mirrorsite.org

总体而言，永远以常识为指南。若特定情境下遵循'公司规章制度'明显荒谬可笑——荒诞程度足以成为*Dilbert*漫画素材——则该制度必须调整。[313]

> Simplicity is our mantra. It creates both reliability and low cost.[314]
>
> 简洁是我们的核心理念。它既确保了可靠性，又降低了成本。[314]

Q: What are the benefits of simplicity at scale?

问：规模化生产中简洁性有哪些优势？

At Tesla, the Model 3 body line in Fremont was only ever meant to make five thousand cars a week, and it's now doing seven thousand. We achieved that by *removing* things. We had been doing a lot of foolish things. We've changed some of the designs and made them simpler and easier to build. Simplicity comes from hundreds of little changes.

在特斯拉，弗里蒙特的Model 3船体线最初设计产能仅为每周五千辆，如今已提升至七千辆。我们通过移除冗余环节实现这一目标。我们过去做了太多徒劳无功的事。我们优化了部分设计，使其更简洁、更易于制造。简洁源自数百项细微改进。

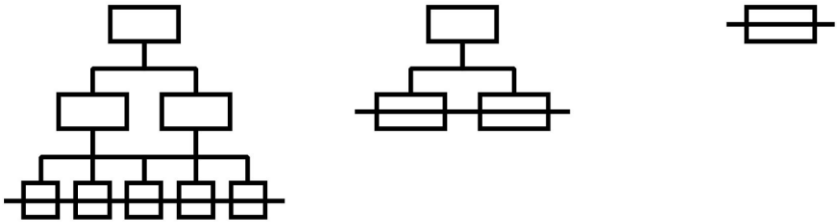
Being able to get 40 percent more output from the same manufacturing line makes a big difference. It also reduces the marginal cost of production and improves the quality of the car. This is the result of a ton of hard work by a lot of people.[315]

同一条制造线提升40%的产能意义重大。这不仅降低了生产边际成本，还提升了车辆品质。这是众人辛勤付出的成果。[315]

更多资源 https://mirrorsite.org

For three months I was at the gigafactory trying to help fix battery production. It’s a lot of little things. I look at every tiny part of each process and ask, “Is this process necessary?”

我曾在超级工厂花费三个月时间协助解决电池生产问题。成功源于无数细节的完善。我审视每个流程的微小部件，不断追问："这个环节是否必要？"



最佳部件是无部件。

最佳过程是无过程。

更多资源 https://mirrorsite.org

> The best part is no part. The best process is no process.[316]
>
> 最高境界的部件就是没有部件。最高境界的流程就是没有流程。[316]

For example, a robot would put a car frame on a turntable. The turntable would rotate and then another robot would pick it up. The problem was the turntable would sometimes break down. So, we eliminated the turntable. With a robot-to-robot handoff, we had one less step, less equipment, and didn't have turntable breakage to consider. It's a lot of this really simple stuff, but a thousand times.[317]

例如，机器人会将汽车框架放置在转台上。转台旋转后，另一个机器人会将其拾起。但问题在于转台有时会发生故障。于是我们淘汰了转台。通过机器人-对-机器人交接，我们减少了一个步骤，精简了设备，也无需考虑转台故障问题。这类基础优化看似简单，但要执行成千上万次。[317]

> It's a lot of minimizing things that can go wrong and maximizing the efficiency of the simple things.[318]
>
> 核心在于持续减少潜在故障点，同时最大化基础操作的效率。[318]

If you've got a whole bunch of separate parts and each of them has a given tolerance—even if that tolerance is tight, like 0.2 millimeter tolerance—but if you've got fifty parts…you have to multiply the variances together. You'll end up with a huge variance between cars. That's one of the reasons it's better to combine parts rather than have more individual parts.

更多资源 https://mirrorsite.org

若系统由众多独立部件构成，即使单个部件公差控制严格（如0.2毫米级），但五十个部件叠加时——其累积方差将呈几何级增长。最终每辆车的差异会非常大。这就是为何整合部件优于使用更多独立零件的原因之一。

In the Model 3 engineering, there were a lot of right answers to the wrong questions.[319]

在Model 3工程设计中，存在许多针对错误问题的正确答案。[319]

Fifty different times for fifty different parts, an engineer would ask, “What’s the best material to make this part out of?” Of course, they would get fifty different answers. They were all true individually, but not true collectively.

五十个不同部件的五十次设计决策中，工程师总会问：‘该部件的最佳材料是什么？’结果自然是五十种不同答案。每个结论单独成立，但整体却不成立。

When you try to join all these parts made of dissimilar metals, there are many issues. You need better sealant to prevent galvanic corrosion. You’ve got to join some with rivets, some with spot welds, some with resin, or resin *and* spot welds. Then it looks like a Frankenstein situation all together.[320]

当尝试组装这些异种金属制造的部件时，会引发诸多问题。需要更强效的密封剂来防止电化学腐蚀。有些需铆接，有些需点焊，有些要用树脂，或树脂加点焊复合连接。整体组装后如同弗兰肯斯坦式的拼合体。[320]

It’s way better to have a single piece, casted. Then you have no gaps, no sealant, no dissimilar metals. You can reduce the size of the body shop in the factory dramatically. Having the rear body cast for Model Y allowed us to reduce the body shop by 30 percent.[321]

更多资源 https://mirrorsite.org

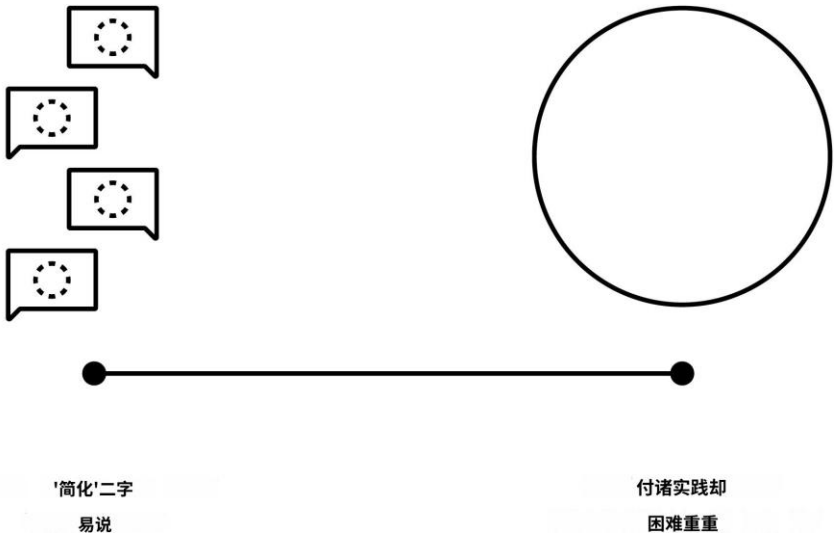
采用单一铸造部件则优越得多。这样既无接缝，也无需密封剂，更无异种金属问题。你可以大幅缩减工厂车身车间的规模。Model Y采用后车身一体压铸后，我们成功将车身车间规模缩减了30%。[321]

There’s roughly a thousand robots on the Model 3 body line. Which, by the way, is not a figure of merit. We got rid of three hundred robots by switching to rear body casting. When we change the front body to casting, we’ll get rid of another three hundred robots. You want fewer things, not more.[322]

Model 3生产线配备了约一千台机器人。顺便说一句，这并非值得夸耀的事。改用后车身一体压铸技术后，我们淘汰了三百台机器人。当前车身也改用压铸技术时，还能再淘汰三百台。少即是多。[322]

> It’s easy to say “simplify,” but it’s very difficult to do it.[323]
>
> '简化'二字说来容易，践行却极为困难。[323]

更多资源 https://mirrorsite.org



更多资源 https://mirrorsite.org

THE ALGORITHM

算法之道

> I became a broken record on The Algorithm. But it’s helpful to say it to an annoying degree.
>
> 我就像复读机般反复强调算法之道，尽管惹人烦厌，但这确实行之有效。

I have everyone at my companies rigorously implement a five-step process for engineering. I call it The Algorithm. I’ll list the steps, then explain. The order is very important.

我要求旗下公司全员严格执行工程学五步法则。 我称之为'算法之道'。现将步骤列出，随后详解。顺序至关重要。

1. Make your requirements less dumb.
1. 让你的需求不再愚蠢。
2. Try very hard to delete the part or process.
3. 竭尽全力删除部件或流程。
4. Simplify or optimize.
5. 简化或优化。
6. Accelerate.
7. 加速。
8. Automate.
9. 自动化。

Q: Why is the order of the steps so important?

问：为什么步骤的顺序如此重要？

更多资源 https://mirrorsite.org

> I’ve personally made the mistake of going backward—on all five steps—multiple times. Many things at Tesla were automated, accelerated, simplified, and then deleted.
>
> 我个人就犯过倒退的错误——在全部五个步骤上——反复多次。特斯拉的许多事务都经历了自动化、加速、简化直至删除的过程。

One example was fiberglass mats on top of the battery pack. At one point I was basically living on the battery pack production line, because it was choking the entire car’s production. The first mistake was trying to fix the automation to make the robot better, to make it move faster on a shorter path. We increased the rate by 20 percent, then 100 percent. Then, we tried to optimize the use of glue and the drying speed.

其中一个例子是电池组顶部的玻璃纤维垫。当时我基本住在电池组生产线上，因为它卡住了整车的生产流程。首个错误是试图修复自动化系统， 让机器人更高效地在更短路径上移动。我们将效率提升了20%，继而达到100%。 随后，我们尝试优化胶水用量和干燥速度。

Automating was a mistake, then accelerating was a mistake, then optimizing was a mistake. Finally, I asked the battery safety team, “What the hell are these mats for? Fire protection?”

自动化是个错误，加速是个错误，优化同样是个错误。最终我问电池安全团队：'这些垫子到底是干什么用的？防火？'

They said, “No, they’re for noise and vibration.”

他们说：“不，那是用来降噪减震的。”

I said, “But…you’re the battery team.”

我说：“但……你们可是电池团队啊。”

更多资源 https://mirrorsite.org

So I asked the noise vibration analysis team, “What’s the mat for?”

于是我询问噪声振动分析团队：“这个垫子有什么用？”

They said fire safety. It was like being in a *Dilbert* cartoon. I feel like I’m in a *Dilbert* cartoon quite frequently.

他们说是防火用的。感觉就像身处呆伯特漫画里。我经常觉得自己置身于呆伯特漫画中。

So we ran a test: a car with and without the fiberglass mats and a microphone in both. No one could tell the difference. So, we deleted the part (the mats), which deleted a step that required two million dollars of robotics, because it was just a big pile of nonsense.[324]

于是我们进行了测试：分别在有和没有玻璃纤维垫的车上放置麦克风。没有人能听出区别。因此我们删除了这个部件（垫子），连带省去了价值两百万美元的机器人操作步骤——因为它根本就是荒谬透顶的设计。[324]

Q: Can you walk me through the steps?

问：能否详细说明具体步骤？

The first step is to question the requirements, and make your requirements less dumb. You have to start there, because otherwise you could get the perfect answer to the wrong question. This step makes the question the least wrong possible.

第一步是质疑要求，让那些要求变得不那么愚蠢。必须从这里开始，否则你可能会为错误的问题找到完美答案。这一步能让问题尽可能接近正确。

Your requirements are definitely dumb. It does not matter who gave them to you. Requirements from smart people are the most dangerous, because

更多资源 https://mirrorsite.org

you’re less likely to question them. Always question requirements, even if it came from me. Everyone is wrong some of the time.

你的要求绝对是愚蠢的。谁提出的要求并不重要。聪明人的要求最危险，因为你更可能不会质疑它们。永远要质疑要求，即使是我提出的。每个人都会犯错。

Whatever requirements or constraints you do have must come from a person, not a department. You can’t actually ask a department. You have to be able to ask a person, and the person putting forth the requirement must take responsibility for that requirement. Otherwise, you could have a requirement made up by an intern two years ago off the cuff, or someone who isn’t even at the company anymore. You must know the name of the real person who made every requirement.

任何要求或约束必须来自具体的人，而非部门。你无法真正询问一个部门。你必须能询问具体的人，提出要求者必须对该要求负责。否则，你可能在执行两年前某个实习生随口提的要求，或是已离职者的要求。你必须知道每条要求的真实提出者姓名。

Many times we’ve had dumb requirements, dug into them, and discovered no one currently working in that department agrees with the requirement. These things are often way more silly than you think. So step one is make your requirements less dumb.[325]

多次遇到愚蠢要求后，经深挖发现该部门现员工无人认同该要求。这些事往往比你想象的荒谬得多。因此，第一步是让需求定义更合理。[325]

Step two: Try very hard to delete the part or process. It sounds obvious, but people often forget to try deleting something entirely.

第二步：全力尝试删除部件或流程。这听起来显而易见，但人们常忘记尝试彻底删除某些内容。

更多资源 https://mirrorsite.org

若重添删减内容的频率未达10%，则说明删减不足。

If you’re not adding deleted things back in 10 percent of the time, you’re clearly not deleting enough. Somewhat illogically, people often feel they’ve succeeded if they are not forced to put anything back in. But actually they have failed in a different way, because they’ve been overly conservative and have left things in there that shouldn’t be.

若删除内容有10%需恢复，说明你删除得还不够彻底。不合逻辑的是，当人们无需恢复任何删除项时，常自认成功。实际上他们以另一种方式失败——因过于保守而保留了本应删除的内容。

更多资源 https://mirrorsite.org

The bias tends to be very strong for adding this part or process step “just in case we need it.” But you can make “just in case” arguments for many, many, many things.

人们总强烈倾向于'以防万一'而添加部件或流程。但'以防万一'的借口可适用于无数事物。

People tend to remember, with sometimes a jarring level of pain, when they deleted something they later needed. They overcorrect, and put too much stuff in there, which overcomplicates things.

当删除后续必需内容时，那种痛彻心扉的记忆往往格外深刻。他们因此过度矫正，添加过多冗余，导致系统过度复杂。

I tell them this in advance: “Look, we’re deliberately going to delete more than we should. Some of the things we delete, we’re going to put back in. At least one in ten things, we’re going to add back in.” People get a little shook by that. But if you’re so conservative in deleting that you never have to put anything back in, you obviously have a lot of stuff that isn’t needed. So, you’ve got to overcorrect for that tendency.

我事先声明：'注意，我们将刻意进行超额删除。我们删除的部分内容将重新添加回来。至少有十分之一的内容将被恢复。"人们对此感到有些震惊。" 但若在删除时过于保守，以至于从未需要恢复任何内容，那显然说明存在大量冗余。因此，必须对这种倾向进行过度矫正。

At SpaceX, I would tell the team, “We are on a deletion *rampage*!! Nothing is sacred. We will delete any remotely questionable tubes, sensors, manifolds, etc. tonight. Please go ultrahardcore on deletion and simplification.” We put immense effort into reducing mass.

在太空探索技术公司，我曾告诉团队："我们正在进行狂热的删减行动！！没有任何事物是神圣不可侵犯的。今晚我们将删除所有存在疑问的管道、传感器、歧管等部件。请以极端严苛的标准执行删减与简化。"我们投入巨大精力减轻质量。

更多资源 https://mirrorsite.org

There's a recursive factor to mass. If you add an extra ton of heat shielding, you also need more fuel to get it to orbit, and you need more fuel to deorbit, and you need more fuel to land it. Also the structure now has more load on it, because it's carrying an extra ton of heat shield. This applies to any given ton.

质量具有递归效应。若增加一吨隔热层，就需要更多燃料将其送入轨道，需要更多燃料使其脱离轨道，还需更多燃料实现着陆。同时结构承载负荷也会增加，因为它需额外承载一吨重的隔热层。这适用于任何给定的吨位。

Adding each ton is almost like adding two tons when it's fully considered. We've calculated it to be around a 1.8 recursion factor, but we're probably forgetting something that gets us closer to two. Every one ton of mass begets an extra ton. That is why it is very important to delete.[326]

全面考量时，每增加一吨几乎相当于增加两吨。我们计算出递归系数约为1.8，但可能遗漏了某些因素使结果更接近2。每增加一吨质量就会带来额外一吨负担，因此删除冗余至关重要。[326]

Recapping so far: Step one, make your requirements less dumb. Step two, try hard to delete the part or process.[327]

当前要点回顾：第一步，消除需求中的不合理要求。第二步，全力删除部件或流程。[327]

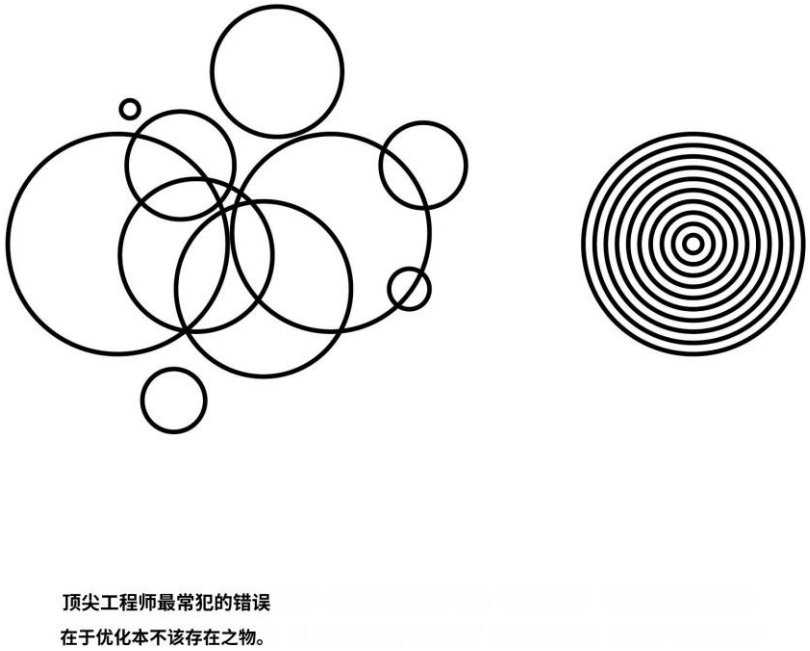
Then, once you have deleted as much as you can, the *third* step is to simplify or optimize. The third step. The *third* step. *Not* the first step. Why?

待尽可能删除冗余后，第三步才是简化或优化。注意是第三步。这是第三步 并非第一步。原因何在？

> The most common mistake of smart engineers is to optimize a thing that should not exist.

更多资源 https://mirrorsite.org

> 优秀工程师最常犯的错误，就是优化本不该存在的事物。



Everyone was trained in high school and college to answer the question in front of them. It’s convergent logic. You can’t tell the professor, “Your question is dumb.” You have to answer the question. Without knowing it, almost everyone has this mental straightjacket on. They’ll work on optimizing a thing that should simply not exist.

更多资源 https://mirrorsite.org

中学到大学的教育都训练人们直接解答眼前问题，这属于收敛性思维。你不能对教授说'你的问题很蠢'，必须回答这个问题。几乎所有人都不自知地戴着思维枷锁，总在优化那些本不该存在的事物。

Then, and only then, step four: accelerate cycle time. Once you're moving in the right direction, and moving efficiently…you're moving too slow. Go faster. You can always make things go faster.

然后，且仅在此之后，第四步：加速周期。当你在正确方向上高效运作时...说明你还不够快。加速前进。你总能提速。

But, do *not* go faster until you have worked on the other three things first. I mistakenly spent a lot of time accelerating processes that I later realized should have been deleted. Speeding up something that shouldn't exist is absurd. If you're digging your grave, don't dig it faster. Stop digging.

但切忌在前三步完善前加速。我曾错误地在应被删除的流程上浪费大量时间提速。为不该存在的事物加速实属荒谬。若你正自掘坟墓，别挖得更快，停下铲子。

Step five, the final step, is to automate. The big mistake I made in the Tesla factories in Nevada and Fremont was trying to automate every step too early. To fix that, we had to tear hundreds of expensive robots out of the production line. We put a hole in the side of the building just to remove all that equipment.[328]

第五步即最终阶段：实现自动化。我在内华达州和弗里蒙特的特斯拉工厂犯的重大错误，就是过早自动化每个环节。为了解决这个问题，我们不得不从生产线中拆除数百台昂贵的机器人。我们在建筑侧面开了一个洞，只是为了移除所有这些设备。[328]

Always wait until the end of designing a process—after you have questioned all the requirements and deleted unnecessary parts—before you introduce automation.[329]

更多资源 https://mirrorsite.org

在质疑所有要求并删除不必要部件之后，始终要等到设计流程的最后阶段再引入自动化。[329]

282 Magel, ed., *Musk's Memos*.

282 马格尔编，《马斯克的 备忘录》。

283 Magel, ed., *Musk's Memos*.

283 马格尔编，《马斯克的 备忘录》。

284 Magel, ed., *Musk's Memos*.

284 马格尔 编，《马斯克的 备忘录》。

285 Magel, ed., *Musk's Memos*.

285 马格尔 编，《马斯克的 备忘录》。

286 "Tesla Factory Tour with Elon Musk!," Marques Brownlee, August 20, 2018, YouTube video, 15:19, https://www.youtube.com/watch?v=mr9kK0_7x08.

286 《"与埃隆·马斯克同游特斯拉工厂！》，马克斯·布朗利，2018年8月20日，YouTube视频，15:19，https://www.youtube.com/watch?v=mr9kK0_7x08。

287 "Tesla Factory Tour," Marques Brownlee.

287 《特斯拉工厂参观》，Marques Brownlee。

288 Isaacson, *Elon Musk*.

288 沃尔特·艾萨克森，《埃隆 马斯克》

289 Isaacson, *Elon Musk*.

289 沃尔特·艾萨克森，《埃隆 马斯克》

290 Isaacson, *Elon Musk*.

290 沃尔特·艾萨克森，埃隆 马斯克。

291 Isaacson, *Elon Musk*.

291 沃尔特·艾萨克森，埃隆 马斯克。

292 Magel, ed., *Musk's Memos*.

292 马格尔编，马斯克的 备忘录。

293 "Elon Musk: Digital Superintelligence," Y Combinator.

更多资源 https://mirrorsite.org

293 “埃隆·马斯克：数字超级智能”，Y Combinator。

294 “Elon Musk, Air Warfare Symposium 2020.”

294 “埃隆·马斯克，2020年空中作战研讨会”。

295 “Elon Musk: 10X Every 6 Months.”

295 “埃隆·马斯克：每六个月实现十倍增长”。

296 Tim Dodd, “Talking to Elon Musk and Jim Bridenstine About SpaceX Fly Astronauts for the 1st Time! #DM2,” Everyday Astronaut, May 27, 2020, YouTube video, 21:48, https://www.youtube.com/watch?v=p4ZLysa9Qqg.

296 蒂姆·多德，《与埃隆·马斯克和吉姆·布里登斯廷探讨太空探索技术公司首次载人飞行！#DM2 》，每日宇航员，2020 年 5 月 27 日，YouTube 视频，21:48，https://www.youtube.com/watch?v=p4ZLysa9Qqg。

297 “Elon Musk, Air Warfare Symposium 2020.”

297 《埃隆·马斯克，2020空中作战研讨会 》。

298 “Interview with Elon Musk,” *Motley Fool*, 2011.

298 "埃隆·马斯克专访"，《傻瓜财经》，2011年。

299 “Bill Gates and Elon Musk,” Baidu.

299 "比尔·盖茨与埃隆·马斯克"，百度。

300 “Bill Gates and Elon Musk,” Baidu.

300 "比尔·盖茨与埃隆·马斯克"，百度。

301 “Bill Gates and Elon Musk,” Baidu.

301 "比尔·盖茨与埃隆·马斯克"，百度。

302 “Elon Musk, CEO of Tesla at ONS 2014,” ONS: Energy Meeting Place, November 13, 2014, YouTube video, 26:52, https://www.youtube.com/watch?v=0ZsVxSDB7NY&t=2s.

302 “特斯拉CEO埃隆·马斯克在2014年ONS大会”，ONS：能源会议，2014年11月13日，YouTube视频，26分52秒，https://www.youtube.com/watch?v=0ZsVxSDB7NY&t=2s。

303 Berger, *Liftoff*.

303 伯杰，《升空》。

304 “Elon Musk: 10X Every 6 Months.”

304 "埃隆·马斯克：每6 个月实现十倍增长"

更多资源 https://mirrorsite.org

305 Tim Dodd, “First Look Inside SpaceX’s Starfactory w/ Elon Musk,” Everyday Astronaut, June 22, 2024, YouTube video, 1:04:17, https://www.youtube.com/watch?v=aFqjoCbZ4ik.

305 蒂姆·多德，"太空探索技术公司星际工厂首探：与埃隆·马斯克同行"，每日宇航员，2024年6月22日，YouTube视频，1:04:17，https://www.youtube.com/watch?v=aFqjoCbZ4ik

306 Dodd, “First Look Inside SpaceX's Starfactory.”

306 多德，"太空探索技术公司 星际工厂首探"

307 Dodd, “First Look Inside SpaceX's Starfactory.”

307 多德，《首次探秘太空探索技术公司的 星际工厂》

308 Dodd, “First Look Inside SpaceX's Starfactory.”

308 多德，《首次探秘太空探索技术公司的 星际工厂》

309 Isaacson, *Elon Musk*.

309 沃尔特·艾萨克森，《埃隆 马斯克》

310 Isaacson, *Elon Musk*.

310 沃尔特·艾萨克森，埃隆 马斯克。

311 “Musk's 2003 Stanford Lecture.”

311 《马斯克的2003年斯坦福大学 讲座》。

312 “Elon Musk Interview: 1-on-1 with Sandy Munro,” Munro Live, February 2, 2021, YouTube video, 48:58, https://www.youtube.com/watch?v=YAtLTLiqNwg.

312 《埃隆·马斯克专访：桑迪·芒罗一对一》，Munro Live，2021年2月2日，YouTube视频，48:58，https://www.youtube.com/watch?v=YAtLTLiqNwg。

313 Magel, ed., *Musk's Memos*.

313 马格尔编，马斯克的 备忘录。

314 Brad Lemley, “Shooting the Moon,” *Discover Magazine*, September 8, 2005, https://www.discovermagazine.com/the-sciences/shooting-the-moon.

314 布拉德·莱姆利，《登月》，发现杂志，2005年9月8日，https://www.discovermagazine.com/the-sciences/shooting-the-moon。

315 “Third Row Tesla Podcast, Episode 7.”

315 “特斯拉第三排播客，第 7期。”

316 “Tesla Factory Tour,” Marques Brownlee.

更多资源 https://mirrorsite.org

316 “特斯拉工厂参观”，马奎斯 布朗利

317 “Tesla Factory Tour,” Marques Brownlee.

317 “特斯拉工厂参观”，马奎斯 布朗利

318 “Tesla Factory Tour,” Marques Brownlee.

318 《特斯拉工厂参观》，马奎斯 布朗利。

319 “Elon Musk Interview,” Munro Live.

319 《埃隆·马斯克专访》，门罗 直播。

320 “Elon Musk Interview,” Munro Live.

320 《埃隆·马斯克专访》，门罗 直播。

321 “Elon Musk Interview,” Munro Live.

321 《埃隆·马斯克访谈》，Munro Live

322 “Elon Musk Interview,” Munro Live.

322 《埃隆·马斯克访谈》，Munro Live

323 Fridman and Musk, “Lex Fridman Podcast #438.”

323 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

324 Dodd, “Starbase Tour, Part 1.”

324 多德，《星舰基地导览：第1部分》

325 Dodd, “Starbase Tour, Part 1.”

325 多德，《星舰基地导览，部件 1》。

326 Tim Dodd, “Starbase Tour with Elon Musk [PART 2 // Summer 2021],” Everyday Astronaut, August 7, 2021, YouTube video, 1:01:18, https://www.youtube.com/watch?v=SA8ZBJWo73E.

326 蒂姆·多德，《埃隆·马斯克带你参观星舰基地【第2部分 // 2021年夏季】》，每日宇航员，2021年8月7日，YouTube视频，1:01:18，https://www.youtube.com/watch?v=SA8ZBJWo73E。

327 Dodd, “Starbase Tour, Part 1.”

327 多德，《星舰基地导览，部件 1》。

328 Isaacson, *Elon Musk*.

更多资源 https://mirrorsite.org

328 沃尔特·艾萨克森，埃隆 马斯克

329 Isaacson, *Elon Musk*.

329 沃尔特·艾萨克森，埃隆 马斯克

更多资源 https://mirrorsite.org

MANIACAL URGENCY

狂热的紧迫感

> A maniacal sense of urgency is our operating principle.[330]
>
> 极度紧迫感是我们的运营准则。[330]

更多资源 https://mirrorsite.org

DON’T WASTE TIME

切勿浪费时间

Excessive meetings are the blight of big companies and almost always get worse over time. Get rid of all large meetings, unless you’re certain they are providing value to the whole audience, in which case, keep them short.

过多会议是大公司的顽疾，且往往随着时间推移愈发严重。取消所有大型会议，除非能确定其为全体参与者创造价值——此类会议也应尽量简短。

Also get rid of frequent meetings, unless you are dealing with an extremely urgent matter. Meeting frequency should drop rapidly once the urgent matter is resolved.

同时减少例会频率，除非处理极端紧急事项。紧急事项解决后，会议频率应立即大幅降低。

Walk out of a meeting or drop off a call as soon as it is obvious you aren’t adding value. It is not rude to leave; it is rude to make someone stay and waste their time.

当明确无法贡献价值时，立即离场或退出通话。中途离场并非失礼；强迫他人滞留消耗时间才是无礼之举。

更多资源 https://mirrorsite.org

SPEED IS BOTH OFFENSE AND DEFENSE

速度即是最强攻防

> The only true currency is time.[331]
>
> 时间才是唯一的真实货币。[331]

The best offense and defense is speed. The SR-71 Blackbird is a military plane with almost no defense except acceleration. It was never shot down. Not even once. Over three thousand missiles were shot at the SR-71 Blackbird and none hit. All it did was go faster. The power of speed is underappreciated as a competitive factor.[332]

速度就是最好的进攻与防守。SR-71黑鸟侦察机除加速性能外几乎无防御能力，却从未被击落——一次都没有。超过三千枚导弹曾射向SR-71黑鸟侦察机，但无一命中。它所做的只是加速飞行。速度作为竞争要素的价值被严重低估。[332]

The real way you actually achieve intellectual property (IP) protection is by innovating fast. If your rate of innovation is high, then you don’t need to worry about protecting the IP because other companies will be copying something you did years ago. That’s fine. Just make sure your rate of innovation is fast. Speed of innovation is what matters.[333]

实现知识产权保护的根本途径在于快速创新。若创新速度足够快，则无需担忧知识产权保护——竞争对手复制的将是你若干年前的成果。这无妨。只需确保创新速度持续领先。创新速度才是关键。[333]

更多资源 https://mirrorsite.org

We obviously cannot compete with the big car companies in size, so we must do so with intelligence and agility.[334] A factory moving at twice the speed of another factory is basically equivalent to two factories. The company will succeed if it can do with one factory what takes other companies two, three, or four factories. We try to think, “How can we make each factory produce what would normally require five or even ten factories?”[335]

We obviously cannot compete with the big car companies in size, so we must do so with intelligence and agility. | 我们显然无法在规模上与大型车企抗衡，因此必须凭借智慧与敏捷性制胜。[334] 以两倍速度运行的工厂本质上相当于两座工厂。若本公司单座工厂能达成他企需两座、三座甚至四座工厂才能实现的产能，企业必将成功。我们持续思考：'如何使单座工厂产出常规需五座乃至十座工厂才能实现的产能？'[335]

> I have a running triage of what I do at each company, constantly thinking, “What is the most useful thing I could do?”[336]
>
> 我对每家公司的职责都进行动态筛选，持续思考：'当下最有价值的事是什么？'[336]

In early SpaceX, I told the team everything we did was a function of our burn rate. We were burning through a hundred thousand dollars per day. In the same way, I expected the revenue in ten years to be ten million dollars a day. Every day we were slower to achieve our goals was a day of missing out on that revenue.[337]

在太空探索技术公司初创期，我告诉团队：我们的一切行动都围绕烧钱率展开。当时我们日均消耗十万美元。同理，我预期十年后日营收将达到千万美元。每延迟一天达成目标，就意味着错失当日收益。[337]

更多资源 https://mirrorsite.org

You need to be a vector, not just a scalar. That means you need to go at high speed *in the right direction*. No company will *always* be going in the right direction all the time—so you have to do course corrections, like a guided missile.[338]

你必须成为矢量，而非标量。这意味着你需要朝着正确方向高速前进。没有企业能永远保持正确航向——因此必须像制导导弹般实时修正轨迹。[338]

I try to work as much as possible—to the edge of sanity. Every good hour or even minute of thinking about Tesla and SpaceX has such a big effect on the company. It makes sleeping difficult.

我尽可能高强度工作——直至理智边缘。为特斯拉和太空探索技术公司投入的每一小时甚至一分钟深度思考，都将对企业产生巨大影响。这会让人难以入眠。

Tesla is getting to the point where every high-quality minute of thinking has a million-dollar impact. That is insane. If Tesla is doing $2 billion a week in revenue, that's about $300 million a day, seven days a week. There are many instances where a half-hour meeting improved the company's financial outcome by $100 million.[339]

特斯拉正处在这样的阶段：每一分钟高质量的思考都会产生百万美元级的影响。这简直不可思议。若特斯拉每周营收达20亿美元，即日均约3亿美元，一周七天持续运转。多次实例证明，半小时的会议就能为公司财务成果带来1亿美元的提升。[339]

更多资源 https://mirrorsite.org

DO THINGS IN PARALLEL

并行处理

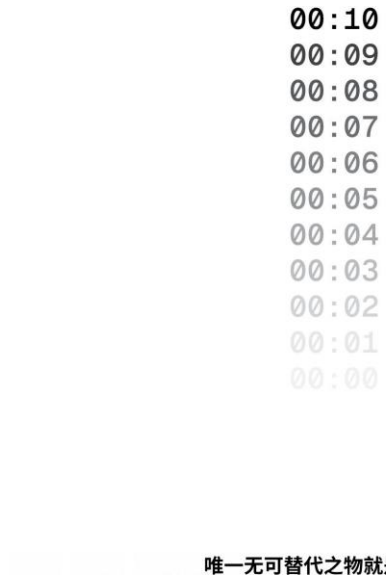
Everything is measured in terms of time. What is the time risk associated with something?

一切事物皆以时间为衡量基准。某件事伴随的时间风险是什么？

The one thing you cannot replace is time.[340]

唯一不可替代的就是时间。[340]

更多资源 https://mirrorsite.org



For PayPal, we needed to establish a lot of back-office relationships to attach various data sources. The credit card system for processing credit cards, the Federal Reserve System for doing electronic funds transfers, the various fraud databases to run fraud checks. There was a lot we had to interface with, and it took a while to set all that up.

在PayPal时期，我们需要建立大量后台关系来对接各类数据源。处理信用卡的信用卡系统、进行电子转账的美联储系统，以及运行欺诈检

更多资源 https://mirrorsite.org

查的各种欺诈数据库。我们需要对接的系统很多，建立这些连接耗费了大量时间。

But by doing them all in parallel, it all came together simultaneously. Developing the software and having it ready for the general public coincided with us concluding deals with the outside vendors. All that took about a year.[341]

但通过并行推进，所有环节最终同步完成。软件开发完成并准备面向公众时，我们恰好与外部供应商达成了合作协议。整个过程耗时约一年。[341]

Avoid serialized dependencies. A lot of things have a “gestation period” and there is nothing you can do to accelerate it. If you can have all those things gestating in parallel, that will substantially accelerate your overall timeline. People tend to serialize too much. Put as many gestating elements in parallel as possible.[342]

避免顺序依赖。许多事务存在'孕育期'，其进程无法加速。若能并行推进所有环节，将显著缩短整体时间线。人们往往过度依赖顺序执行。尽可能实现多元素并行推进。[342]

> If a timeline is long, it’s wrong.[343]
>
> 若时间线过长，必然存在问题。[343]

更多资源 https://mirrorsite.org

BREAK DOWN THE “IMPOSSIBLE”

解构'不可能'

The general principles of first-principle thinking apply to software, hardware, anything really. Often, we were told something was impossible, but once we broke it down into its constituent elements, we could solve those.[344]

第一性原理思维的通用法则适用于软件、硬件及任何领域。 我们常被告知某些事不可实现，但将其分解为基本要素后，每个问题都能迎刃而解。[344]

For xAI in 2024, we were trying to build a training supercluster (a giant network of computers to train an AI model). We went to the various suppliers and said we needed one hundred thousand H100s (superpowerful computer chips) to be able to train coherently. Their estimates for how long it would take to complete that were eighteen to twenty-four months. Well, we needed to get that done in six months or we wouldn’t be competitive.

2024年对xAI而言，我们正全力构建训练超级计算集群（用于训练人工智能模型的巨型计算机网络）。 我们向多家供应商提出需求：需十万个H100超级计算芯片以保障训练连贯性。供应商给出的完工周期预估为十八至二十-四个月。但我们必须在六个月内完成，否则将丧失竞争力。

So, we broke that down. We need a building; we need power; we need cooling.

为此我们分解任务：需场地、需电力、需冷却系统。

We didn’t have enough time to build a building from scratch. So, we found a factory in Memphis that was no longer in use. The input power was 15

更多资源 https://mirrorsite.org

megawatts and we needed 150 megawatts. So, we rented generators and put them along one side of the building.

新建厂房根本来不及。最终在孟菲斯找到闲置工厂，但其输入功率仅15兆瓦，而我们需要150兆瓦。解决方案是租赁发电机，沿建筑侧翼部署。

Then, we needed cooling. So, we rented about a quarter of the mobile cooling capacity of the US and put the chillers on the other side of the building.

接着，我们需要解决冷却问题。于是我们租用了美国约四分之一的移动冷却设备，并将冷却装置部署在大楼另一侧。

That didn’t fully solve the problem because the power variations during training are very big. Power can drop by 50 percent in 100 milliseconds, which the generators can’t keep up with. So then we added Tesla megapacks and modified the software in the megapacks to be able to smooth out the power variation during the training run.

但这未能完全解决问题，因为训练期间的功率波动极大——100毫秒内功率可能骤降50%，发电机无法跟上这种变化。为此我们增加了特斯拉megapack，并修改其内部软件，使训练过程中的功率波动得以平滑化。

Then there were a bunch of networking challenges. Networking cables for one hundred thousand GPUs (graphics processing units) are very, very difficult. We ran the networking team to do the cabling in four shifts, 24/7. I was sleeping in the data center and doing cabling myself.[345]

随后又面临系列网络挑战。十万块GPU（图形处理器）的网络布线极其复杂。我们安排网络团队四班倒，24小时不间断进行布线。我睡在数据中心，亲力亲为参与布线工作。[345]

Now called Colossus, it is currently the largest AI training platform in the world. It was constructed in 122 days. Ninety-two days later, it had been

更多资源 https://mirrorsite.org

doubled to two hundred thousand GPUs.[346]

该平台现名Colossus，是目前全球最大的AI训练平台。其建设周期仅122天。九十二天后，规模已扩容至二十万块GPU。[346]

更多资源 https://mirrorsite.org

SET AGGRESSIVE TIMELINES

设定激进时间表

> I often tell the Tesla team: "It's okay to scrap equipment or money. It's not okay to scrap time."[347]
>
> 我常对特斯拉团队说："报废设备或浪费资金是可以接受的。但浪费时间绝对不行。"[347]

When I was interviewing for a vice president of machining, I explained I was paying for everything at SpaceX out of pocket. I asked him, "What's the cheapest you would work for?" He haggled, and eventually we agreed. Ten minutes later, I gave him a contract. This was a Saturday at 5:00 p.m. He started working that night.[348]

面试机加工副总裁时，我说明太空探索技术公司的所有运营开支都由我个人承担。我问他：'你能接受的最低薪资是多少？'经过协商，我们最终达成一致。十分钟后，我当场向他交付了合同。当时是周六下午5点。他当晚就投入了工作。[348]

Q: Do you deliberately make aggressive prediction timelines to drive people to be ambitious?

问：你是否刻意设定激进的预测时间表来驱动团队保持进取心？

For internal timelines, we set the most aggressive timelines we can. I do this because there's a kind of "law of gaseous expansion" for schedules. Whatever time you set, it's not going to be less than that. It's rare that something will ever get done faster than the schedule.[349]

更多资源 https://mirrorsite.org

对于内部时间表，我们会设定能力范围内的最激进目标。这么做是因为时间安排存在某种‘气体膨胀定律’。 无论设定多短周期，实际耗时都必然超出预期。项目提前交付的情况极为罕见。[349]

When I cite a schedule, it is actually the schedule I think is true. It’s not some fake schedule I made up. It may be delusional—that is entirely possible, and that has happened from time to time. But it’s never some knowingly fake deadline, ever.[350]

我提出的时间表，本质上就是我认定切实可行的真实期限。这不是我凭空捏造的日程表。它可能过于理想化——这种情况确实时有发生，也完全有可能。但绝非刻意设置的虚假截止日期，从未有过。[350]

I want to emphasize that some dates are not dates that will actually be met. For example, the initial release date for the Model 3 at Tesla was an impossible date because there are seven thousand unique components in the Model 3, and our deadline assumed all of them would arrive on time. That won’t happen. But, it was a date for us to hold ourselves (internally) and our suppliers to.[351]

必须明确：部分预定日期本身就不具备可操作性。以特斯拉Model 3为例，初始发布日期就是不可能实现的，因为该型号涉及七千种独特零部件，而我们的时间预设是所有部件都能准时到位——这绝不现实。但该日期对内可敦促团队，对外能约束供应商。[351]

> I do have a habit of being optimistic with schedules.[352]
>
> 我确实习惯性地在时间规划上偏向乐观。[352]

When I give estimates about our production, it’s guesswork. Especially guesses about exponential curves. In exponential growth, the difference a year or two makes to an outcome is enormous. We got a lot of criticism for the number of cars we delivered in 2017. The area under the curve of

更多资源 https://mirrorsite.org

production in 2017 was quite small because it was the beginning of an exponential ramp, but once that growth got going, the area under the curve was enormous. That's why people were so shocked. I kept trying to say this, but people don't understand what exponential means.[353]

关于生产目标的预估，本质上属于推测范畴。尤其是指数曲线的预判更具挑战性。在指数级增长模型中，一两年时间差会导致结果产生数量级差异。2017年的汽车交付量让我们饱受质疑。当年生产曲线下面积微乎其微，因其处于指数爬坡初期；但增长态势形成后，曲线下面积便呈现爆发式扩张。这就是人们如此震惊的原因。我反复强调这一点，但人们始终无法理解指数增长的含义。[353]

In 2018, we doubled our global fleet, cumulatively. We made and delivered about as many cars as we had in our entire history. Most people thought it wasn't possible. If you predicted linear growth, it wouldn't seem possible.

2018年，我们的全球车队规模实现了累计翻番。我们制造交付的车辆总量，几乎等同于公司整个历史时期的总产量。绝大多数人都认为这不可能实现。若按线性增长预测，这确实显得难以企及。

But when making estimates involving exponential growth, small changes in the calendar breakpoint have enormous percentage differences in outcome. The time difference is small, but the percentage difference in the outcome is enormous.[354]

但在指数增长预测中，时间节点的微小偏移会导致结果产生巨大百分比差异。时间间隔虽短，结果差异的百分比却极为显著。[354]

As far as our predictions are concerned, the media tends to report all the wrong ones and ignore all the correct ones. I've had a long career in multiple industries. If you list just my sins, I sound like the worst person on Earth. But if you put those in the context of what I've done right, it makes much more sense.

更多资源 https://mirrorsite.org

就预测准确性而言，媒体总是报道所有错误案例，却对正确预测视而不见。我在多个行业拥有漫长的从业经历。若只罗列我的失误，我堪称地球上最糟糕的人。但若置于正确决策的背景下，这些失误就变得合乎情理。

> I don’t want to blow your mind, but I’m not always right.[355]
>
> 无意冒犯，但我并非永远正确。[355]

The longer you do anything, the more mistakes you will make, cumulatively. If you sum up just the mistakes, it sounds like I’m the worst predictor ever, which is not the case.

做任何事情的时间越长，累积犯错的概率就越大。若只统计错误，听起来我像是史上最差预测者，但事实并非如此。

Some of them happen sooner or later, but they do tend to come true. It’s rare they do not come true eventually. For radical technology predictions, the point is not that it was a few years late, but that it happened at all. That’s the more important part.[356]

有些预测迟早会成真，只是时间问题。最终未能实现的预测实属罕见。对于颠覆性技术预测，重点不在于延误几年，而在于它终究实现了——这才是关键。[356]

> I may be a little optimistic, but I always deliver.[357]
>
> 我可能略显乐观，但总能兑现承诺。[357]

330 Isaacson, *Elon Musk*.

更多资源 https://mirrorsite.org

330 沃尔特·艾萨克森，埃隆 马斯克。

331 Musk, “Interview with David Faber,” X Spaces.

331 马斯克，《与大卫·费伯的访谈》，X 空间。

332 “Elon Musk: 10X Every 6 Months.”

332 《埃隆·马斯克：每6 个月实现十倍增长》。

333 “Elon Musk, Air Warfare Symposium 2020.”

333 《埃隆·马斯克，2020年空中作战研讨会 》。

334 Magel, ed., *Musk's Memos*.

334 马格尔（编），马斯克的 备忘录。

335 Elon Musk, “Tesla Battery Day,” Tesla, September 22, 2020, YouTube video, 2:11:29, https://www.youtube.com/watch?v=l6T9xIeZTds.

335 埃隆·马斯克，《特斯拉电池日》，特斯拉公司，2020年9月22日，YouTube视频，时长2:11:29，https://www.youtube.com/watch?v=l6T9xIeZTds。

336 “Musk, Stanford GSB 2013.”

336 “马斯克，斯坦福商学院 2013。”

337 Ashlee Vance, *Elon Musk: Tesla, SpaceX, and the Quest for a Fantastic Future* (Ecco, 2015).

337 阿什利·万斯，埃隆·马斯克：特斯拉、太空探索技术公司与探索非凡未来（Ecco出版社，2015年）。

338 “Elon Musk: 10X Every 6 Months.”

338 “埃隆·马斯克：每六个月实现 十倍增长。”

339 “Elon Musk at TED2022.”

339 “埃隆·马斯克在 TED2022大会”

340 Dodd, “Starbase Tour, Part 2.”

340 多德，“星舰基地导览·第 2部分”

341 “Musk's 2003 Stanford Lecture.”

341 “马斯克2003年 斯坦福大学演讲”

342 “Musk's 2003 Stanford Lecture.”

更多资源 https://mirrorsite.org

342 “马斯克的2003年斯坦福大学 演讲。”

343 Isaacson, *Elon Musk*.

343 沃尔特·艾萨克森，埃隆 马斯克。

344 “Elon Musk: Digital Superintelligence,” Y Combinator.

344 “埃隆·马斯克：数字超级智能”，Y Combinator。

345 “Elon Musk: Digital Superintelligence,” Y Combinator.

345 “埃隆·马斯克：数字超级智能”，Y Combinator。

346 xAI, “Colossus: Our Gigafactory of Compute,” accessed November 14, 2025, https://x.ai/colossus.

346 xAI，“巨像：我们的计算千兆工厂”，访问于2025年11月14日，https://x.ai/colossus。

347 “Elon Musk Answers All Your Questions (Investor Day 2023),” CNET Highlights, March 1, 2023, YouTube video, 41:03, https://www.youtube.com/watch?v=ZFzhO6fZ9vQ.

347 “埃隆·马斯克回答所有问题（2023年投资者日）”，CNET Highlights，2023年3月1日，YouTube视频，41分03秒，https://www.youtube.com/watch?v=ZFzhO6fZ9vQ。

348 Berger, *Liftoff*.

348 伯杰，升空。

349 Chris Anderson and Elon Musk, “Elon Musk: A Future Worth Getting Excited About,” TED, April 17, 2022, YouTube video, 1:06:24, https://www.youtube.com/watch?v=YRvf00NooN8.

349 克里斯·安德森与埃隆·马斯克，《埃隆·马斯克：令人振奋的未来》，TED大会，2022年4月17日，YouTube视频，1:06:24，https://www.youtube.com/watch?v=YRvf00NooN8。

350 “Elon Musk | Full interview | Code Conference 2016,” On with Kara Swisher, June 2, 2016, YouTube video, 1:24:14, https://www.youtube.com/watch?v=wsixsRI-Sz4.

350 《埃隆·马斯克 | 完整专访 | 2016年代码大会》，卡拉·斯威舍访谈，2016年6月2日，YouTube视频，1:24:14，https://www.youtube.com/watch?v=wsixsRI-Sz4。

351 “Tesla Motors (TSLA) Elon Reeve Musk on Q1 2016 Results: Earnings Call Transcript,” Seeking Alpha, May 4, 2016, https://seekingalpha.com/article/3971543-tesla-motors-tsla-elon-reeve-musk-on-q1-2016-results-earnings-call-transcript.

351 “特斯拉汽车公司(TSLA)埃隆·里夫·马斯克2016年第一季度业绩：财报电话会议记录”，Seeking Alpha，2016年5月4日，https://seekingalpha.com/article/3971543-tesla-motors-tsla-elon-reeve-musk-on-q1-2016-results-earnings-call-transcript。

352 Dodd, “Starbase Tour, Part 2.”

更多资源 https://mirrorsite.org

352 多德，“星舰基地导览，部件 2。”

353 “Elon Musk Podcast Feb 2019 Full,” ARK Invest, Thayqua, February 21, 2019, YouTube video, 29:13, https://www.youtube.com/watch?v=MOy3MTZ9Dyg.

353 "埃隆·马斯克播客2019年2月完整版"，ARK投资，Thayqua，2019年2月21日，YouTube视频，29:13，https://www.youtube.com/watch?v=MOy3MTZ9Dyg。

354 “Elon Musk Podcast,” ARK Invest.

354 "埃隆·马斯克播客"，ARK 投资。

355 Anderson and Musk, “A Future Worth Getting Excited About.”

355 安德森与马斯克，"值得为之兴奋的 未来"。

356 Anderson and Musk, “A Future Worth Getting Excited About.”

356 安德森与马斯克，《一个值得期待的未来》。

357 Battelle and Musk, “Web 2.0 Summit 08.”

357 巴特尔与马斯克，《Web 2.0峰会08》。

更多资源 https://mirrorsite.org

WE MUST MAKE STUFF

我们必须制造实物

> Manufacturing is underrated. It’s hard.[358]
>
> 制造被低估了。这很难。[358]

更多资源 https://mirrorsite.org

THE REAL WORK

真正的工作

> Some people have an absurd view of the economy as a magic thing that just produces stuff.
>
> 有些人对经济抱有荒谬的看法，认为它像魔法般凭空创造物质。

They think goods and services magically come from somewhere, and if somebody has more stuff than somebody else, it's because they took more from this magic source of stuff.[359]

他们认为商品和服务会魔法般地出现，如果有人比别人拥有更多物质，那只是因为他们从这个魔法源泉中拿走了更多。[359]

Now, let me break it to the fools out there. If we don't make stuff, there's no stuff. If we don't grow the food, process the food, and transport the food… there's no food. Medical treatments, getting your teeth fixed, everything. There's no stuff if we don't make stuff.

现在，让我向那些愚昧之人阐明真相。没有制造，就没有产品。没有粮食种植、加工与运输……就没有食物供给。医疗救治、牙齿诊疗，概莫能外。不制造则无产品。

Some people have become detached from reality. This notion that the government can just send checks out to everybody and everything will be fine is not true—*obviously*. You can't just legislate money to solve things. If you don't make stuff, there is no stuff. The whole machine could grind to a halt.[360]

更多资源 https://mirrorsite.org

部分人已脱离现实。政府只需普发支票就能万事大吉的想法实属谬误——显而易见。 立法拨款无法根本解决问题。不制造则产品不复存在。整个系统可能全面瘫痪。[360]

Technological progress is not inevitable. It’s not some kind of abstract concept. Humans make technology. If we don’t do it, it will not happen.[361]

技术进步并非必然趋势。这绝非抽象概念。技术由人类创造。不行动则无改变。[361]

> Somebody has to do the real work.
>
> 实干者不可或缺。

There’s an overallocation of talent in finance and law, especially in the United States. Too many smart people go into finance and law. This is both a compliment and a criticism. We should have fewer people doing law and finance and more people making stuff.

金融与法律领域存在严重的人才配置失衡，美国尤甚。过多精英涌入这些行业，此评价既是肯定也是批判。我们应当减少法律与金融从业者，增加实体制造人才。

Manufacturing used to be highly valued in the United States. These days it hasn’t been as much, which I think is wrong. Making cars is an honest day’s living, that’s for sure. Making anything or providing a valuable service like good entertainment, good information—these are valuable things to do.[362]

制造业曾在美国备受推崇，如今却未得到足够重视，我认为这是错误的。造汽车确实是份实实在在的营生。创造实体产品或提供优质娱乐、优质信息等有价值的服务——这些才是真正有价值的事业。[362]

更多资源 https://mirrorsite.org

I’ve got mad respect for the makers of things.[363]

我对实干家们怀有由衷的敬意。[363]

更多资源 https://mirrorsite.org

THE FACTORY IS THE PRODUCT

工厂即产品

> The biggest epiphany I had building Tesla is what really matters is the machine that builds the machines—the factory.[364]
>
> 创建特斯拉过程中最大的顿悟是：真正重要的是制造机器的机器——即工厂本身。[364]

To accelerate a sustainable future, Tesla had to scale up production volume as quickly as possible. That is why Tesla engineering transitioned to focus heavily on designing the machine that makes the machines—turning the factory itself into the product.

为加速可持续未来进程，特斯拉必须尽快提升生产规模。因此特斯拉工程团队转向重点设计'制造机器的机器'——将工厂本身转化为终极产品。

A first-principles physics analysis of automotive production suggests that somewhere between a fivefold to tenfold improvement is achievable by version three on a roughly two-year iteration cycle.[365]

基于物理学第一性原理对汽车生产进行分析表明，通过约两年迭代周期，到第三代版本时生产效率可实现五至十倍的提升。[365]

Tesla believes strongly in making things. Apple and Google do not. It’s a philosophical difference. We believe that manufacturing technology is itself subject to a tremendous amount of innovation. In fact, we believe there’s more potential for innovation in manufacturing than in the design of a car—

更多资源 https://mirrorsite.org

by a long shot. This is just a philosophical difference. Perhaps we are wrong. But we believe in manufacturing, and a company that values manufacturing as highly as we do will attract the best minds in manufacturing.[366]

特斯拉坚信制造实物的理念。苹果和谷歌则不然。这是理念上的根本差异。我们坚信制造技术本身蕴含着巨大的创新空间。事实上，我们相信制造环节的创新潜力远超汽车设计领域——差距巨大。这只是理念差异。但也许我们错了。但我们信奉制造业，像我们这样高度重视制造的公司，必将吸引顶尖的制造人才。[366]

> Our success or failure will not be because of competition. It will be our capability to make a high-quality product at a price people can afford.[367]
>
> 我们的成败不取决于市场竞争。关键在于能否以大众可承受的价格制造出高品质产品。[367]

You've got this giant factory, a cybernetic collective with ten thousand things going wrong and you've got to solve them all. Fast. If you don't solve problems fast enough, the factory doesn't go. A big factory burns a huge amount of money every minute you aren't making a product.[368]

面对巨型工厂这个控制论共同体，成千上万个环节可能出错，你必须快速解决所有问题。速度决定一切——问题解决稍有延迟，生产线就会停滞。停工状态下，大型工厂每分钟都在消耗巨额资金。[368]

更多资源 https://mirrorsite.org

ATTACK THE CONSTRAINT

攻克瓶颈

> Designing a rocket is trivial.
>
> 设计火箭易如反掌。

There are tons of books you can read, and if you can understand equations, you can design a rocket. Real easy. But making even one of these things and getting it to orbit is very hard.[369]

有海量书籍可供研读，只要掌握方程式原理，设计火箭绝非难事。但即便制造一枚火箭并将其送入轨道，都堪称艰难卓绝。[369]

It’s the same thing for cars. It’s easy to make a car prototype; it’s hard to do car production.[370]

汽车制造领域同样如此。打造汽车原型轻而易举；实现量产却举步维艰。[370]

This is underappreciated. People think there is a “eureka” moment where you come up with an idea and that’s it. They believe design is the hard part and production is just making copies. That’s completely false.[371]

这常被世人低估。人们总幻想存在'顿悟时刻'，似乎灵光乍现便大功告成。他们误以为设计是核心难点，生产不过是简单复制。此乃彻头彻尾的谬见。[371]

At Tesla, we learned a valuable lesson. The production line will move as fast as the slowest and least lucky part of the entire production line. Let’s

更多资源 https://mirrorsite.org

say there are ten thousand things that have to go right for production to work. If you have 9,999 things working and one that isn't, that sets the production rate.[372]

特斯拉的实践让我们汲取了宝贵经验。整条生产线的运行速率，取决于最迟缓且最不稳定的环节。假设量产成功需万无一失。纵有九千九百九十九项达标，唯有一项未遂，该环节便成为决定生产效率的关键瓶颈。[372]

Things move as fast as the least lucky or least competent supplier. Any natural disaster you care to name has happened to our suppliers. A supplier had a factory burn down. An earthquake. A tsunami. Massive hail. A tornado. A ship sank. A shoot-out at the Mexican border. I'm not kidding. That delayed trunk carpet.[373]

进度取决于最不幸运或最不称职的供应商。你能想到的任何自然灾害都曾发生在我们的供应商身上。供应商工厂被烧毁、遭遇地震、海啸、巨型冰雹、龙卷风，还有货轮沉没。墨西哥边境还发生过枪战。我可不是在开玩笑。就因为这耽误了后备箱地毯的供应。[373]

So when scaling SpaceX, we spent ten to one hundred times more effort on designing the manufacturing system than on designing the Raptor engine.[374] We built the rockets first and the factory later, because building the production system is the harder thing.[375]

So when scaling SpaceX, we spent ten to one hundred times more effort on designing the manufacturing system than on designing the Raptor engine. | 因此在扩展太空探索技术公司规模时，我们在设计制造系统上投入的精力是设计猛禽发动机的10到100倍。[374] 我们先造火箭后建工厂，因为构建生产系统才是更困难的事。[375]

Design is overrated, and manufacturing is underrated. There is 1,000 percent, maybe 10,000 percent more work that goes into the production system than the product itself.[376] Especially for a product with new

更多资源 https://mirrorsite.org

technology. The difficulty of manufacturing is proportionate to the amount of new technology in the product.[377]

Design is overrated, and manufacturing is underrated. There is 1,000 percent, maybe 10,000 percent more work that goes into the production system than the product itself. | 设计被高估了，制造却被低估了。生产系统投入的工作量是产品本身的100倍甚至1000倍。[376] 尤其是对于采用新技术的产品而言。制造难度与产品所含新技术的数量成正比。[377]

更多资源 https://mirrorsite.org

MANUFACTURING IS THE MOAT

制造即护城河

Two things define manufacturing competitiveness: economies of scale and technology. If you maximize your level of technology and maximize your level of scale, this is obviously going to be the most competitive situation. That's why plants are so freaking giant.[378]

制造竞争力由两大要素定义：规模经济与技术。若将技术水平与生产规模同步最大化，显然将形成最具竞争力的格局。这正是工厂如此庞大的核心原因。[378]

Our plant in Texas starts from actual rail cars of raw materials coming in. We form the battery cell and the battery pack, build the motor, and cast the parts. We also have introduced a major innovation, which is to cast the entire front third and rear third of the car as a single piece. I got this idea from toy cars.

我们在德克萨斯州的工厂从原料铁路车厢进厂开始，逐步完成电池单体与电池包的生产，制造电机并铸造部件。我们还实现了一项重大创新：将整车前三分之一与后三分之一作为整体铸件一次成型。这个创意源自玩具车。

I wondered, "Toys are cheap! How do they make toys?"

我当时想：'玩具这么便宜！他们是怎么制造的？'

"They just cast them."

'直接整体铸造就行了'

I was like, "Well, can you build a casting machine big enough for a car?"

更多资源 https://mirrorsite.org

于是我问：'那能否建造足够大的铸造机来生产整车？'

They said, “No one ever has.”

他们回答：'前所未有'

“Are we breaking any laws of physics?”

'这违反物理学定律吗？'

“No…”

'不...'

“Well, let’s just ask them.”

“这样吧，我们直接问他们。”

There were six major casting machine suppliers in the world at the time. Five of them said no and the sixth said maybe. I said, “I’ll take that as a yes.”[379]

当时全球有六家主要压铸机供应商。其中五家明确拒绝，第六家表示可能考虑。我说：“我就当你们同意了。”[379]

> Prototypes are easy and fun. Reaching volume production with a reliable product at an affordable price is excruciatingly difficult.[380]
>
> 原型机制作轻松有趣，但要实现可靠产品的量产并以合理价格推向市场，整个过程极其艰难。[380]

358 “Elon Musk,” Full Send Podcast.

358 《埃隆·马斯克》，全力播客

更多资源 https://mirrorsite.org

359 Rogan and Musk, “JRE #1470.”

359 罗根与马斯克，《JRE第1470期》

360 Rogan and Musk, “JRE #1470.”

360 罗根与马斯克，《JRE第1470期》。

361 Isaacson, *Elon Musk*.

361 沃尔特·艾萨克森，埃隆 马斯克。

362 Rogan and Musk, “JRE #1470.”

362 罗根与马斯克，《JRE第1470期》。

363 Musk (@elonmusk), X account.

363 马斯克 (@elonmusk)，X 账户。

364 “Elon Musk on How to Build the Future.”

364 《埃隆·马斯克谈如何建设 未来》

365 Elon Musk, “Master Plan, Part Deux,” *Tesla Blog*, July 20, 2016, https://www.tesla.com/master-plan-part-deux.

365 埃隆·马斯克，《宏伟蓝图，第二篇章》，《特斯拉博客》，2016年7月20日，https://www.tesla.com/master-plan-part-deux。

366 “Tesla Q1 2016 Earnings Call.”

366 “特斯拉2016年第一季度财报电话会议。 ”

367 “Elon Musk,” Full Send Podcast.

367 “埃隆·马斯克”，Full Send 播客。

368 “Elon Musk,” Full Send Podcast.

368 “埃隆·马斯克”，Full Send 播客。

369 “Elon Musk, Air Warfare Symposium 2020.”

369 “埃隆·马斯克，2020年空中作战研讨会。”

370 Rogan and Musk, “JRE #1609.”

370 罗根与马斯克，《JRE第1609期》

371 Dodd, “Starbase Tour, Part 1.”

更多资源 https://mirrorsite.org

371 多德，《星舰基地导览：第一部分》

372 Joe Rogan and Elon Musk, "#2054: Elon Musk," October 31, 2023, in *The Joe Rogan Experience*, podcast, 2:41:00, https://open.spotify.com/episode/7edwvm2c6Ieuzun4xtFYCJ.

372 乔·罗根与埃隆·马斯克，"#2054：埃隆·马斯克"，2023年10月31日，于乔·罗根体验，播客，2:41:00，https://open.spotify.com/episode/7edwvm2c6Ieuzun4xtFYCJ

373 "Elon Musk," Code Conference 2016.

373 《埃隆·马斯克》，代码大会 2016。

374 Dodd, "Starbase Tour, Part 1."

374 多德，《星舰基地导览，第 1部》。

375 Dodd, "Starbase Tour, Part 2."

375 多德，《星舰基地导览，第 2部》。

376 Dodd, "Starbase Tour, Part 1."

376 多德，《星舰基地导览，部件 1》

377 Rogan and Musk, "JRE #2054."

377 罗根与马斯克，《JRE #2054》

378 Musk, "Caltech Commencement Speech."

378 马斯克，《加州理工学院毕业 典礼演讲》

379 Musk, "Caltech Commencement Speech."

379 马斯克，《加州理工学院毕业 典礼演讲》

380 "Elon Musk Interview," Munro Live.

380 "埃隆·马斯克专访"，Munro Live。

更多资源 https://mirrorsite.org

PART III

第三部分

更多资源 https://mirrorsite.org

BUILDING COMPANIES

企业建设

Q: What fuels your creativity?

问：什么驱动着你的创造力？

Pressure. Necessity.[381]

压力。必然。[381]

381 Rainn Wilson and Elon Musk, “Tesla’s Elon Musk Meets Rainn Wilson in the Metaphysical Van Long Before the Cybertruck Was a Thing,” SoulPancake, October 8, 2021, YouTube video, 25:11,https://www.youtube.com/watch?v=jMkwsSAIAfY.

381 雷恩·威尔逊与埃隆·马斯克，"特斯拉的埃隆·马斯克遇见雷恩·威尔逊：在赛博卡车诞生之前的形而上之旅"， SoulPancake， 2021 年 10 月 8 日， YouTube 视频， 25:11，https://www.youtube.com/watch?v=jMkwsSAIAfY。

更多资源 https://mirrorsite.org

BECOMING A FOUNDER

成为创始人

> You want to embark on something where success is certain to be one of the possible outcomes.[382]
>
> 你应当投身于那些成功至少是可能结果之一的事业[382]

Q: What was the path to starting your first company?

问：创办首家企业经历了怎样的历程？

Growing up in South Africa, it seemed like a lot of the advanced technology was being produced in America and Silicon Valley, especially. I wanted to go where I could be involved in the creation of new technology. That's what took me first to Canada (because I could get citizenship in Canada through my mom) and then ultimately to the US.[383]

在南非成长期间，似乎绝大多数尖端技术都源自美国，尤其是硅谷我渴望前往能够参与新技术创造的地方这驱使我先前往加拿大（通过母亲获得公民身份），最终抵达美国[383]

When I was seventeen, I got my Canadian passport. Three weeks later I was in Canada.[384] I left South Africa and landed in Montreal. I arrived with a backpack, a suitcase of books, and $2,000.

更多资源 https://mirrorsite.org

When I was seventeen, I got my Canadian passport. Three weeks later I was in Canada. | 十七岁时，我取得了加拿大护照三周后我已身在加拿大[384]
离开南非抵达蒙特利尔时，我只带着行囊、一箱书籍和2000美元

I stayed in a youth hostel for a few days, then bought a bus ticket for one hundred bucks to go across the country, making stops along the way.[385]

在青年旅社暂住数日后，我花一百美元买了张横穿加拿大的巴士票，沿途停歇[385]

I managed to get to Swift Current in Saskatchewan. My cousin’s son had a wheat farm where I worked for about six weeks, as I turned eighteen. We did a barn raising, cleared out the wheat bins and grain silos, and worked the vegetable patch.[386]

我辗转抵达萨斯喀彻温省的斯威夫特卡伦特。适逢十八岁之际，我在表亲儿子的麦田农场劳作约六周我们进行了集体劳作，清理了麦仓和谷仓，还在菜园子里干活。[386]

Then I got back on the bus and went to Vancouver. I had a half-uncle there in the lumber industry. I ended up working at a lumber mill chainsawing logs and cleaning out the pulp boiler. That might be the hardest job I’ve had. You had to crawl through this little tunnel in a hazmat suit and then shovel this steaming sand and mush out of the boilers to clean them out. There’s only one entrance or exit, a little tunnel. If you’re claustrophobic, it would be real bad. It did not seem safe. But it was the highest-paying job at the employment office. Other jobs were under eight dollars an hour, and this one was eighteen dollars an hour.[387]

然后我回到巴士上去了温哥华。我在那里有个从事木材业的远房-叔叔。 最终我在锯木厂工作，用链锯伐木并清理纸浆锅炉。那可能是我做过最艰难的工作。你得穿着防护服爬进狭窄通道，然后用铁锹清理锅炉里滚烫的沙状糊物。只有一个出入口，就是那条小通道。如果你有幽闭恐惧症，那真是糟糕透顶。看起来也不安全。但这是当地就业

更多资源 https://mirrorsite.org

中心薪酬-最高的工作。其他工作每小时不到八美元，而这份工作每小时十八美元。[387]

I worked there as a lumberjack doing odd jobs for a few months. Then I applied for college, and went to Queen's University in Kingston. I was there for a couple years before applying to UPenn. I didn't think I'd be able to go because I was paying my own way through university. That's not too hard in Canada because tuition is highly subsidized, but in the US college is more expensive.[388]

我在那里当伐木工，干了几个月的杂活。之后我申请大学，进入金斯顿的女王大学就读。在那里待了两年后申请宾夕法尼亚大学，当时觉得可能无法入学，因为所有学费都得自行承担。这在加拿大不算太难，因为学费补贴力度大，但在美国上大学费用更高。[388]

> I paid my own way through college and dropped out of Stanford grad school with $110K in college debt.[389]
>
> 我自费完成大学学业，还带着十一万美元的大学债务从斯坦福研究生院辍学。[389]

Physics and computer science were always my two best subjects, because I wanted to figure out the nature of the universe. I thought I might do physics at a particle accelerator, banging particles together to see what happens in a research facility. Then, the supercollider got canceled in the US, and I realized I could study for years to work at a collider, and then the government could arbitrarily cancel it. Decision made: I could not do that.[390]

物理学和计算机科学始终是我的最强项，因为我渴望探究宇宙的本质。曾考虑在粒子加速器研究机构工作，通过粒子对撞实验观察物理现象。后来美国超级对撞机项目夭折，我意识到可能苦读多年只为进

更多资源 https://mirrorsite.org

入对撞机领域，政府却可任意取消项目。于是决定：这条路走不通。[390]

Q: How did you decide to leave your PhD program and start your first company?

问：您为何决定放弃博士学业创办第一家公司？

Because of my interest in electric cars as a college student, I took an internship at a company that made high-energy-density capacitors. My intent was to get a PhD in energy storage solutions for electric vehicles. I was going to Stanford to study material science and the physics of high-energy-density capacitors for use in electric vehicles.[391]

大学时因对电动汽车感兴趣，我在一家生产高能量密度电容器的公司实习。我原本计划攻读电动汽车储能解决方案的博士学位。当时计划进入斯坦福大学，研究用于电动汽车的高能量密度电容器材料科学与物理原理。[391]

But, I wasn't sure if my work during that PhD would actually be useful. I was concerned it could be academically useful but not practically useful.[392]

但我不确定博士期间的研究能否产生实际价值。担心研究成果可能仅具学术价值而缺乏实用意义。[392]

Success on an academic level would have been quite likely. I could publish a paper, but most papers are pretty useless.[393] Once in a while you get something spectacular but it's pretty rare.[394] How many PhD papers are actually used by someone, ever? Percentagewise, not many. You add a leaf to the tree of knowledge, but that leaf could be saying, *Nope, not possible. This is not good enough technology to be used in an electric vehicle.* There goes seven years of my life.[395]

Success on an academic level would have been quite likely. I could publish a paper, but most papers are pretty useless. | 在学术层面获得成功本是大概率事件。或许能发表论文，但多数论文都毫无价值。[393] Once in a

更多资源 https://mirrorsite.org

while you get something spectacular but it’s pretty rare. | 偶尔会有惊人突破，但这种情况实属罕见。[394] 究竟有多少博士论文曾被实际应用过？从比例来看，寥寥无几。你为知识之树添上新叶，但这片叶子可能宣告：此路不通。这种技术尚未达到电动汽车应用标准。我的七年光阴就此虚掷。[395]

Not that I cared about the PhD, actually. I just needed a lab. I could spend years working in a lab and maybe the technology would work…or maybe it wouldn’t.[396]

其实我本不在意博士学位，只是需要实验室。本可耗费数年进行研究，或许技术终将突破...亦或徒劳无功。[396]

> I was not sure success was even a possibility. I thought maybe it was, but I wasn’t sure.[397]
>
> 当时我甚至不确定成功是否可能。虽觉或有希望，但并无把握。[397]

Then the internet started taking off. It was clear to me the internet was happening in 1995, although most people weren’t aware of it then.[398] I was pretty sure success was one of the possible outcomes for an internet company. I knew watching the internet get built while doing a PhD would be frustrating.[399] I decided to put graduate school on hold and start an internet company.[400]

Then the internet started taking off. It was clear to me the internet was happening in 1995, although most people weren’t aware of it then. | 正值互联网浪潮初起。1995年我已预见互联网时代的降临，尽管当时世人大多尚未察觉。 [398] I was pretty sure success was one of the possible outcomes for an internet company. I knew watching the internet get built while doing a PhD would be frustrating. | 我确信成功是互联网企业可能

更多资源 https://mirrorsite.org

达成的结果之一。我深知若继续攻读博士，只能旁观互联网建设大潮而无法投身其中，必将令人懊丧。[399] 我决定暂停研究生学业，创办一家互联网公司。[400]

I thought I'd be able to come back to electric vehicles. I figured electric vehicle technology and energy storage technology would have a natural progression, and that ended up happening.

我以为自己之后还能重返电动载具领域。我认为电动载具技术和储能技术会自然演进，后来事实证明确实如此。

In 1995, it was not obvious you could make any money on the internet. Until Netscape went public in late 1995, nobody thought you could make a valuable internet company. Now it seems obvious. But back then, it was not at all.

1995年时，人们并不认为互联网能盈利。直到1995年末网景公司上市前，没人相信能创建有价值的互联网企业。如今看来这显而易见。但在当时，这绝非显而易见。

Humanity was effectively becoming a superorganism, qualitatively different from what it had been before. I wanted to be part of that. I wanted to help build humanity's nervous system.[401]

人类正实质性地演化为超级有机体，其本质已与从前截然不同。我希望成为其中的一部分。我渴望协助构建人类神经系统。[401]

The internet turned out to be a good idea for my first company because software is a low-capital endeavor. I didn't have any money, and had a bunch of student debt. You don't need a lot of tooling and equipment to get started. Software you can just write by yourself. It's not capital intensive. Starting something software-related as your first company is much, much easier.[402]

互联网被证明是我首家公司的不错选择，因为软件属于低资本投入领域。我当时身无分文，还背负着学生贷款债务。起步阶段无需大量工

更多资源 https://mirrorsite.org

具设备。软件完全可以独立编写。这并非资本密集型产业。将软件相关领域作为首次创业方向，门槛要低得多。[402]

更多资源 https://mirrorsite.org

STARTING ZIP2

创办Zip2公司

> When we first started Zip2, our ambitions were quite low: make enough money to pay rent.[403]
>
> 我们初创Zip2公司时目标很朴素：赚足房租即可。[403]

Q: When did you start your first company?

问：您何时创立第一家公司？

Starting a company was not actually the first thing I tried. I tried to get a job at Netscape, but they didn't reply to my emails. So I went to hang out in the lobby at Netscape. I didn't know who to talk to, and I was too shy to talk to anyone. I figured, "If I can't get a job, I'll just try writing my own software."[404]

创业并非我最初的尝试。我曾尝试入职网景公司，但未获邮件回复。于是我就在网景公司大厅守候，既不知该找谁接洽，又因胆怯不敢主动搭话。当时我想："既然求职无门，不如自行开发软件。"[404]

It wasn't actually from the desire to start a company. I just wanted to be part of building the internet in some way. Since I couldn't get a job at an internet company, I had to start one myself.[405]

这并非源于创业的渴望。我只是想以某种方式参与互联网建设。既然无法进入互联网公司工作，就只能自己创业。[405]

更多资源 https://mirrorsite.org

I wanted to try to build something useful, but I didn’t think I would build anything particularly great. Probabilistically, greatness seemed unlikely, but I wanted to at least try.[406]

我曾想尝试创造些有用的东西，但从不认为自己能做出非凡成就。从概率角度看，伟大看似渺茫，但我想至少要奋力一试。[406]

We started off building maps, directions, and classified ads. It was, to the best of my knowledge, the first map and directions on the internet. There may still be some patents—or maybe they lapsed at this point. (Note from Eric: there is, patent #5944769.[407]) The whole initial code base I wrote myself because there wasn’t anyone else. It was just me.[408]

We started off building maps, directions, and classified ads. It was, to the best of my knowledge, the first map and directions on the internet. There may still be some patents—or maybe they lapsed at this point. (Note from Eric: there is, patent #5944769. | 我们最初开发了地图、导航和分类广告系统。据我所知，这是互联网上首个地图与导航服务。相关专利可能依然有效——或已过期失效。(埃里克注：确实存在，专利号#5944769。[407]) 整个初始代码库都由我独立编写，因为当时别无他人。只有我自己。[408]

I was twenty-four at the time and only had a few thousand dollars saved. I convinced my brother to join, and he brought about five thousand dollars, which was a lot for us. For the first few months, we only had one computer. When the website wasn’t working, it was because I was compiling code. The website was up during the day; I was coding at night, seven days a week, all the time. We more or less squatted in the office because the landlord was always out of the country, and nobody was using it.[409]

当时我年仅二十四岁，积蓄不过几千美元。我说服弟弟加入，他带来了约五千美元——这对我们已是巨款。前几个月我们仅有一台电脑。网站无法运行时，是因为我正在编译代码。白天网站正常运行；我每晚都在编写代码，每周七天，从不间断。我们基本占用了办公室，因为房东总在国外，无人使用。[409]

更多资源 https://mirrorsite.org

Soon, there were six of us. Me, my brother, a friend of my mom's, and three salespeople we hired on contingency by putting an ad in the newspaper.[410]

很快团队扩大到六人：我、弟弟、母亲的朋友，以及三名通过报纸广告招聘、按业绩提成的销售人员。[410]

Things were pretty tough in the early going. I didn't have any money. In fact, I had negative money because of a huge student debt. I couldn't afford an apartment and an office, so I rented an office because that was cheaper. I slept on the futon at the office and showered at the YMCA. I briefly had a girlfriend in that period and to stay with me, she had to sleep in the office. I was in the best shape—every day a workout, shower, and you're good to go![411]

创业初期异常艰难。我当时身无分文。实际上负债累累，因背负巨额学生贷款。无力同时负担公寓与办公室，只能选择更便宜的办公室。睡办公室蒲团，在YMCA洗澡。那段时间交的女友要陪我住，也只能睡办公室。那是我状态最佳时期——每日健身、冲个澡，就能精力充沛投入工作！[411]

There was a small internet service provider on the floor below us, so we drilled a hole through the floor and connected a modem cable. That got us our internet connection for one hundred bucks a month. We had a tiny revenue stream, but an absurdly tiny burn rate. We actually had more revenue than we had expenses. When we talked to VCs (venture capitalists), we could say we were profitable.[412]

我们楼下有家小型互联网服务供应商，于是我们在楼板钻了个孔，接上调制解调器线缆。这样我们每月只需支付一百美元就能联网。我们收入微薄，但烧钱率却低得惊人。实际上我们收入已覆盖支出。与风险投资人接洽时，我们已能宣称公司实现盈利。[412]

> Most venture capitalists wouldn't take a meeting with us, though.

更多资源 https://mirrorsite.org

但多数风投机构都拒绝会面。

They said, “Who’s made money on the internet? No one. Okay, pass.”[413]

对方表示：“互联网领域谁真正盈利了？没有。那就这样吧。”[413]

There was a lot more interest in the internet following the Netscape IPO (initial public offering). Our software was more impressive by then, too. Mohr Davidow Ventures (a VC firm) invested $3 million for 60 percent of the company, which we thought was crazy. They’re going to give us money for nothing? They must be mad. It seemed insane to give us so much money for a company that consisted of six people at the time. But it worked out well for them.[414]

网景IPO之后，市场对互联网的热情明显高涨。当时我们的软件也更具竞争力。莫戴风投注资三百万美元换取60%股权，我们觉得这简直疯狂。他们准备白送资金？肯定是疯了。当时仅六人的团队能获得如此巨额融资，实在难以置信。但最终结果对他们非常有利。[414]

Q: How did the original idea for Zip2 come about?

问：Zip2公司的最初构想是如何形成的？

We needed to build something that would earn money quickly. We thought the media industry would need help converting their content from print to electronic, and they clearly had money. If we could help them move to the internet, maybe we could generate revenue. There was no advertising revenue on the internet at the time. That was the basis of Zip2.[415]

我们需要尽快打造出能够快速盈利的产品。我们认为传媒行业需要将印刷内容数字化，而该行业显然资金充足。若能协助其转型互联网，

更多资源 https://mirrorsite.org

或许就能实现创收。当时互联网尚未形成广告营收模式。这便是Zip2公司的创立基础。[415]

We hired a lot more people and wrote software to bring newspapers online. Knight Ridder, New York Times Company, and Hearst all became investors and customers. And at one point, Zip2 was responsible for a significant section of the New York Times Company website. I got to know the media industry well.[416]

我们大幅扩充团队规模，开发软件助力报业实现数字化转型。奈特-里德报业集团、纽约时报公司与赫斯特集团均成为投资方兼客户。Zip2公司曾负责运营纽约时报公司官网的重要板块。这让我对传媒行业有了深刻认知。[416]

The challenge was too much control by the existing media companies. They had too many board seats and too much voting control over Zip2. They kept trying to push the company in directions that made no sense. We actually had good software—comparable to Yahoo! or Excite at the time. It was all being forced through media companies, who would not fully use it. We built the best technology, but it wasn't being deployed properly.[417]

核心问题在于既有媒体公司控制过度。他们占据过多董事会席位，对Zip2的投票控制权过大，不断试图将公司引向毫无意义的发展方向。当时我们的软件确实出色——与雅虎或Excite相比毫不逊色。所有技术都被迫经由媒体公司推广，而他们未能充分利用。我们开发了顶尖技术，却未得到恰当部署。[417]

> It's a bit like building F-22 fighter jets and selling them to people who roll them down the hill at each other. Not the way to use the technology![418]
>
> 这就像制造了F-22战斗机，却卖给只会把它们当滚木桶推下山互

更多资源 https://mirrorsite.org

> 撞的人。技术可不是这样用的！[418]

That’s when I realized you want to sell your products straight to the end consumer. If you’ve got great technology, go directly to the end consumer. Don’t sell it to some bonehead legacy company that doesn’t understand how to use it.[419]

那一刻我顿悟：必须将产品直接销售给终端用户。若手握卓越技术，务必直抵终端用户。别卖给那些顽固守旧、根本不懂如何运用的公司。[419]

Fortunately, Compaq came along.[420] We had the opportunity to sell Zip2 to Compaq in early 1999 and accepted that offer. It was a little over $300 million in cash. Cash is a currency I highly recommend.[421]

Fortunately, Compaq came along. | 所幸康柏公司适时出现。[420] 1999年初我们把握良机，将Zip2公司出售给康柏并接受了报价。现金交易额略超3亿美元。现金是我强烈推荐的硬通货。[421]

To this day, that moment astonishes me. At the time I was living in a house with four housemates. Literally, a check came in my mailbox. I was like, “This is insane. What if somebody…? I mean, I guess they’d have trouble cashing it?” Seems like a weird way to send money. My bank account went from $5,000 to $21,005,000.[422]

时至今日，那个瞬间仍令我惊叹——当时我还与四位室友挤在同一屋檐下。字面意义上，一张支票寄到了我的信箱里。我当时想：“这太疯狂了。如果有人……？ 我的意思是，他们兑现支票可能会遇到麻烦？”这种汇款方式似乎很奇怪。我的银行账户余额从5000美元变成了2150万美元。[422]

Immediately after the sale, I didn’t take any time off. I still had to pay taxes, then I ended up putting almost all of that into X.com (which became

更多资源 https://mirrorsite.org

PayPal). This was early 1999, and there were a lot of opportunities remaining on the internet.[423]

出售完成后，我立即投入了新的工作。仍需缴纳税款，之后我将几乎全部资金投入了X.com（后成为PayPal）。当时是1999年初，互联网领域仍存在着大量机遇。[423]

> I've always wanted to push my chips back on the table or play the next level of the game. I'm not good at sitting back.[424]
>
> 我始终渴望将筹码重新推上赌桌，或是挑战更高难度的游戏。我不擅长袖手旁观。[424]

更多资源 https://mirrorsite.org

GOING ALL IN, AGAIN (ZIP2 EARNINGS INTO PAYPAL)

再次全情投入（将Zip2公司收益投入PayPal）

> It was frustrating.
>
> 这令人沮丧。

We built incredible technology at Zip2, and it had not been used. I wanted to build another internet company to show technology can be extremely effective when used properly.[425]

我们在Zip2公司开发了卓越的技术，却未能得到实际应用。我希望创立另一家互联网企业，以此证明技术若能恰当运用，将产生极为显著的成效。[425]

I felt like we had our wings clipped somewhat with Zip2. I wanted to avoid being constrained by our customers like that, and go direct-to-consumer. That's what motivated me to start PayPal.[426]

我感觉Zip2公司时期我们像被剪了翅膀。我想避免被客户那样束缚，采用直达消费者模式。这正是促使我创立PayPal的动力。[426]

Q: How did you come up with the idea for PayPal?

问：PayPal的创意是如何诞生的？

I thought, *What was essentially digital? What exists in the form of information, but is not high bandwidth?* In 1999, most people still had modems, so video was not really feasible. Money is low bandwidth and mostly digital. What can we do to make money work better?[427]

更多资源 https://mirrorsite.org

我在思考：什么是本质上的数字化存在？哪些以信息形式存在，却不需要高带宽？1999年大多数人还在用调制解调器，视频传输并不现实。货币是低带宽且高度数字化的产物。我们如何优化货币运作机制？[427]

Money is like a database for guiding people to decide what they should do. You can think of banks as a set of databases.[428]

货币如同引导人类决策的数据库，银行本质上就是一组数据库系统。[428]

The 1990s financial infrastructure was a bunch of ancient mainframes, running ancient code, doing batch processing with poor security, and a series of heterogeneous databases. A herky-jerky frickin' monstrosity.

1990年代的金融基础设施充斥着古老的大型机，运行着过时代码，采用安全性低下的批处理模式，以及一系列异构数据库。一个七拼八凑的怪胎。

From an information theory standpoint, finance would be much better if it could be real-time, secure, and fast. Essentially just one real-time database. Let's try to build that.

从信息论角度看，金融系统若能实现实时化、安全且高速运转，效率将大幅提升。本质上只需构建一个实时数据库。让我们尝试实现它。

Q: Can you explain the PayPal idea from an information theory perspective?

问：能否从信息论角度阐释PayPal的核心理念？

Think of money as information. People often think money has power in and of itself. It does not. Money is just information. Money is a database for resource allocation across time and space.

更多资源 https://mirrorsite.org

将货币视为信息载体。人们常以为货币本身具有力量，实则不然。货币仅是信息媒介。货币是跨越时空配置资源的数据库。

Let’s try thinking in the limit, as I explained before. If you are stranded on a tropical island with a trillion dollars, it’s useless. On the island there are no resources to allocate, except yourself, so money doesn’t help. If you’re stranded with no food, all the Bitcoin in the world will not stop you from starving.

如我之前所述，让我们尝试极限推演思考法。若被困热带荒岛，纵有万亿美元也毫无价值。岛上没有可分配的资源，除了你自己，所以金钱毫无用处。如果你被困且没有食物，世界上所有的比特币都无法阻止你挨饿。

You need something to create ratios of value between products and services. In an economy, you have a massive number of products and services. You can’t trade for everything. That would be extremely unwieldy. You need something to create the ratio of exchange between goods and services. You also need something that allows us to shift obligations across time, like debt and equity.[429]

你需要某种东西来建立产品与服务之间的价值比率。在经济体中，存在海量的产品与服务。你无法进行所有商品的交易。那样会极为笨拙。你需要某种媒介来创建商品与服务之间的交换比率。你还需要某种能够让我们跨时间转移义务的工具，比如债务和股权。[429]

The quality of money as a system is a function of different variables. Just like an internet connection, you want high bandwidth, low latency, and few errors.[430]

货币系统的质量是不同变量的函数。就像互联网连接一样，你需要高带宽、低延迟和低错误率。[430]

What PayPal really did was help improve the bandwidth—the speed at which money could move. Instead of mailing checks back and forth, you could do real-time exchange of money online. Sellers could then ship items

更多资源 https://mirrorsite.org

immediately instead of waiting for a check and then for the bank to clear it.[431]

PayPal真正做的是帮助提高资金流动的带宽——即资金转移的速度。无需来回邮寄支票，你就可以在线进行实时资金转账。卖家可以立即发货，而无需等待支票处理和银行清算。[431]

> We should look at currencies from an information theory standpoint.
>
> 我们应该从信息论视角审视货币体系。
>
> Whichever has least error and latency will win.
>
> 错误率最低、延迟最小的系统将胜出。

That's what X.com originally was. I thought we should try to do all the financial things as well—not just payments. I still think that's what PayPal should have done, but whatever. It's water under the bridge at this point.[432]

这正是X.com最初的定位。我认为我们应当涵盖所有金融业务——不仅仅是支付。至今我仍认为这是PayPal本该采取的策略，但已成定局。此事已是覆水难收。[432]

I rolled most of my Zip2 money into X.com, investing $12.5 million.[433] In 1999, Sequoia invested in X.com, buying $5 million in shares, and Mike Moritz joined the company's board. When Moritz invested, he said we should hire a CEO. I said, "Great, I don't want to be CEO." I had no desire to be a CEO. It's a lot of chores…being CEO sucks. He also told me, "Dude, you should not invest basically everything except your house and car in your startup. "[434]

更多资源 https://mirrorsite.org

I rolled most of my Zip2 money into X.com, investing $12.5 million. | 我将Zip2公司收益的绝大部分投入X.com，投资金额达1250万美元。[433] 1999年，红杉资本向X.com注资500万美元认购股份，迈克·莫里茨加入公司董事会。莫里茨投资时建议聘请CEO，我当即表示'太好了，我本就不想担任CEO' 。我毫无担任CEO的意愿， 那意味着大量行政杂务...CEO的职位糟糕透了。他还告诫我：'老兄，除了房产和车辆，你不该把全部身家押在初创企业上。'[434]

I kept the chips on the table.[435]

我将筹码保留在桌面上。[435]

更多资源 https://mirrorsite.org

LISTEN WELL, CORRECT FAST

善于倾听，快速修正

The initial thought with X.com was to create a conglomeration of financial services, so you have one place where all your financial service needs could be seamlessly integrated and work smoothly.

X.com最初的构想是打造金融服务聚合平台，让用户在一个地方无缝整合并顺畅处理所有金融需求。

We had a little feature: payments through email. When we showed the system to someone, we'd show the hard part first: the conglomeration of financial services. Nobody was interested.

我们当时开发了特色功能：电子邮件支付。向客户演示系统时，我们先展示核心难点——金融服务聚合功能，结果无人感兴趣。

Then we showed people email payments, which were relatively easy to build, and everybody was interested. So, we focused on email payments. That's what really got PayPal to take off.

随后展示相对简易的邮件支付功能时，却引起了普遍关注。于是我们集中精力开发邮件支付功能。正是这个功能让PayPal真正腾飞。

It's important to take feedback from your environment. If we hadn't responded to what people said, we probably would not have been successful. It's important to look for things like that, focus on them, and correct your prior assumptions. You want to close those loops as quickly and clearly as possible.[436]

从环境反馈中汲取信息至关重要。若当时未响应客户意见，我们很可能就此失败。必须敏锐捕捉这类信号，聚焦核心，及时修正原有假

更多资源 https://mirrorsite.org

设。要尽可能快速、清晰地完成这类闭环。[436]

I’m trying to create an accurate mental model of reality. If I have a wrong view on something, or if there’s a nuanced improvement that can be made, I say, “I used to think this, which turned out to be wrong—thank goodness I don’t have that wrong belief anymore.”[437]

我正致力于构建一个精确的现实心智模型。若我对某事的认知存在偏差，或存在可优化的细微之处，我会坦言：'我曾持此观点，但事实证明其谬误——幸好我已摒弃这一错误信念。'[437]

> I’m a huge believer in taking feedback.
>
> 我坚定奉行积极听取反馈的原则。

We took a similar approach with PayPal that worked at Zip2, which was to have a small group of very talented people, and keep it small. PayPal had maybe thirty engineers for a system which I would say is more sophisticated than the Federal Reserve clearing system.

我们在PayPal延续了Zip2公司的成功策略：组建精英小团队并保持精简规模。PayPal仅用约三十名工程师构建的系统，其复杂程度我认为更胜美联储清算系统。

Both Zip2 and PayPal operated like Silicon Valley startups. Pretty flat hierarchy, everybody had a similar desk, and anyone could talk to anyone.

Zip2与PayPal皆沿袭硅谷初创企业的运作模式。实行扁平化管理结构，全员办公环境趋同，倡导无障碍沟通。

We had a philosophy of “best idea wins” as opposed to the person proposing the idea winning because of who they are. Even though there were times when I thought that should have been the way to go. Everyone was an equity stakeholder.[438]

更多资源 https://mirrorsite.org

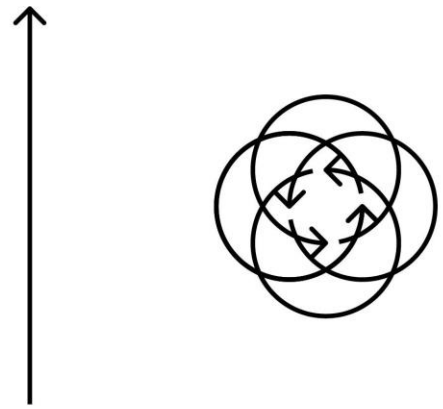
我们秉持'最佳创意胜出'的核心理念——决策依据是创意本身而非提议者身份。即便有时我认为身份优先更合理，仍坚持此原则。全员皆为股权持有者。[438]

If there were two options, and one wasn’t obviously better than the other, rather than spend time trying to pick which one was slightly better, we would just pick one and go. Sometimes we were wrong and picked the suboptimal path, but at least we moved fast.[439]

若有两个选择且优劣难分，与其耗时纠结孰优孰劣，不如择一而行。纵使偶选次优路径，行动迅捷方为要义。[439]

> Better to pick a path and keep moving than just vacillate endlessly on a decision.
>
> 当机立断持续前行，远胜于决策时的无尽踌躇。

更多资源 https://mirrorsite.org



选定道路持续前行，远胜于无休止地犹豫不决。

We were focused on building the best product we possibly could. Both Zip2 and PayPal were product-focused companies. We didn’t worry too much about intellectual property paperwork. We were incredibly obsessive about building the best possible customer experience. That was a far more effective selling tool than having a giant sales force or marketing gimmicks.[440]

我们专注于打造力所能及的顶尖产品。Zip2公司与PayPal皆是产品导向型企业。我们未在知识产权文书工作上过度耗费精力。我们以极致

更多资源 https://mirrorsite.org

执着雕琢最佳客户体验。此策略远胜庞大销售团队或营销噱头，实为高效推广利器。[440]

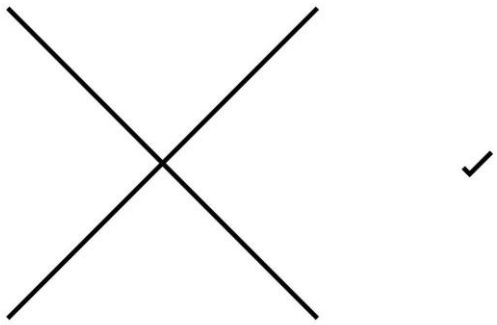
Pay close attention to negative feedback, and solicit it, particularly from friends. It’s incredibly helpful.

务必重视负面反馈并主动征求——尤以友人意见为贵，其价值不可估量。

This may sound like simple advice, but hardly anyone does it.[441]

此言虽似老生常谈，却鲜有人践行。[441]

更多资源 https://mirrorsite.org



高度重视负面反馈，主动寻求批评，特别是来自朋友的谏言。

这极具裨益。

更多资源 https://mirrorsite.org

UNITE AND CONQUER

团结致胜

> What matters to me is winning, and not in a small way.[442]
>
> 对我而言重要的是赢得胜利，而且绝非小打小闹。[442]

Around the same time I was starting X, another company formed called Confinity, which was Peter Thiel, Max Levchin, Luke Nosek, David Sacks, Ken Howery, etc. At X.com, we had Jeremy Stoppelman, who created Yelp, and Roelof Botha, who went on to run Sequoia. Both companies had a crazy amount of talent.

大约在我创立X公司的同期，另一家名为康菲尼迪的公司成立了，其创始团队包括彼得·蒂尔、马克斯·列夫琴、卢克·诺塞克、大卫·萨克斯、肯·豪瑞等人。而X公司则有后来创建Yelp的杰里米·斯托普尔曼，以及日后执掌红杉资本的鲁洛夫·博塔。两家公司都汇聚了顶尖人才。

Confinity started as a PalmPilot cryptography company, back when you could communicate through the infrared port of a PalmPilot. Then they evolved in the direction of payments as well. We were both in Palo Alto, a block away from each other—at one point, even in the same building. We were competing with each other like maniacs.

康菲尼迪最初是专注于PalmPilot加密技术的公司，当时还能通过设备的红外端口进行通信。随后他们也向支付领域拓展。我们两家公司同在帕洛阿尔托，仅相隔一个街区——有段时间甚至共享同一栋办公楼。当时我们如同宿敌般激烈竞争。

更多资源 https://mirrorsite.org

Finally, we had coffee on University Avenue and said, “Hey, why don’t we just combine our efforts? Otherwise we’re gonna bludgeon each other to death.” We knew we had to get that deal done fast or we were both gonna die.

最终我们在大学路的咖啡馆会面，提议道：'何不整合双方资源？否则只会两败俱伤。'我们深知必须火速达成合并协议，否则两家企业都将走向覆灭。

So we merged Confinity with X.com and raised $100 million in three weeks during March of 2000.[443] About a year later, we changed the company name to the product name, PayPal.[444]

So we merged Confinity with X.com and raised $100 million in three weeks during March of 2000. | 于是我们将康菲尼迪公司与X.com合并，并于2000年3月在三周内成功融资1亿美元。[443] 约一年后，我们将公司名称变更为产品名称PayPal。[444]

> We went from starting a company to fourteen months later merging and having a valuation of $500 million in March of 2000. It felt so sudden, like, “This is completely ridiculous.”[445]
>
> 从创业起步到十四个月后的合并，公司在2000年3月估值已达5亿美元。这一切来得太突然，感觉'简直荒谬至极'。[445]

In April 2000, the market went into freefall.[446] The challenge was keeping the company alive for the next two years.[447]

In April 2000, the market went into freefall. | 2000年4月，市场开始自由落体式暴跌。[446] 此后两年间，维持公司生存成为核心挑战。[447]

更多资源 https://mirrorsite.org

There was a lot of drama; it was a turbulent period. I didn't expect PayPal's growth rate to be what it was, and that created major problems. After the first month of the website being active, we had one hundred thousand customers. It was nutty.[448] We definitely did not anticipate that.[449]

There was a lot of drama; it was a turbulent period. I didn't expect PayPal's growth rate to be what it was, and that created major problems. After the first month of the website being active, we had one hundred thousand customers. It was nutty. | 期间充满戏剧性事件；那是一段动荡时期。我未曾预料PayPal的增长率会如此惊人，这引发了严重问题。网站上线首月就吸引了十万用户，堪称疯狂。[448] 这完全超出我们的预期。[449]

Q: What made PayPal's growth rate so dramatic?

答：PayPal增长率为何如此惊人？

PayPal was a perfect case for viral marketing. Like Hotmail, one customer would be like a salesperson for you, bringing other customers. Customers would send money to a friend and bring that friend into the network. We had this exponential growth, where the more customers we had, the faster it grew. It was like bacteria in a petri dish, following an S-curve.[450]

PayPal堪称病毒式营销的完美案例。如同Hotmail，每位用户都像推销员，自发带来新客户。客户通过向朋友汇款将其纳入网络体系。我们实现了指数级增长：客户基数越大，增速越快。这如同培养皿中的细菌，遵循S-曲线增长规律。[450]

We started off first by offering people twenty dollars if they opened an account and twenty dollars if they referred anyone. Then we dropped it to ten dollars. Then we dropped it to five dollars. As the network got bigger and bigger, the value of the network itself exceeded any sort of carrot that we could offer.[451] We probably spent $60 or $70 million in incentives to build that network. That seems like a lot, but it built a very valuable network. The relative cost depends on your scale. That's a peanut to Google.[452]

更多资源 https://mirrorsite.org

We started off first by offering people twenty dollars if they opened an account and twenty dollars if they referred anyone. Then we dropped it to ten dollars. Then we dropped it to five dollars. As the network got bigger and bigger, the value of the network itself exceeded any sort of carrot that we could offer. | 初期采用双20美元激励：开户奖励与推荐奖励各20美元。随后将奖励额度降至10美元。继而进一步下调至5美元。网络规模持续扩张后，其自身价值已超越所有激励手段。[451] 我们约投入6000万到7000万美元激励资金构建该网络。看似巨额投入，却造就了极具价值的网络资产。相对成本取决于企业规模。这对谷歌而言不过九牛一毛。[452]

Q: Leading through that kind of growth seems very challenging. How did you manage it all?

问：驾驭如此高速增长似乎极具挑战性。您是如何统筹全局的？

I ran PayPal for about the first two years of its existence. We launched after year one, and by the end of year two we had a million customers. It gives you a sense for how fast things can grow. We didn’t have a sales force, VP of sales, or VP of marketing and we didn’t spend any money on advertising.[453]

PayPal成立的前两年基本由我主导运营。我们在第一年上线运营，到第二年末已拥有百万用户规模。这让你切身感受到事物能实现何等迅猛的指数级增长。我们既没有销售团队，也没有销售副总裁或营销副总裁，更未在广告上投入分毫。[453]

It wasn’t easy, because we still had some bugs in the software. Even if the bug only occurs one in one thousand times, that’s still a thousand *angry* customers shouting, “Where is my money!?”

这并非易事，因为软件仍存在部分漏洞。即使故障率仅为千分之一，那也意味着上千名愤怒的客户在咆哮：“我的钱呢！？”

We had a customer service office on University Avenue in Palo Alto with five people. When something went wrong, customer service phones would

更多资源 https://mirrorsite.org

explode. We had many challenges. Various financial regulatory agencies were trying to shut us down. The FTC was trying to shut us down. Visa, MasterCard, and eBay were all trying to have us shut down. There were a lot of battles.[454]

我们在帕洛阿尔托大学路设有五人规模的客服中心。问题发生时，客服热线瞬间被打爆。我们面临着诸多严峻挑战。各类金融监管机构都试图关闭我们的业务。联邦贸易委员会（FTC）试图取缔我们。维萨、万事达和eBay都试图迫使我们停业。当时存在诸多纷争。[454]

It was a close call. We came close to dying in 2000 and 2001.[455]

情况十分危急。2000年和2001年我们曾濒临倒闭。[455]

更多资源 https://mirrorsite.org

FROM EXILE TO EXIT

从放逐到退出

> I was away for two weeks and the management team decided I wasn’t the right guy to run the company.
>
> 我外出两周期间，管理层认定我不适合执掌公司。
>
> Instead of fighting during a critical time, I thought it was best to concede.[456]
>
> 在关键时刻，我认为与其争执不如主动让步。[456]

It’s not a good idea to leave the office when there are a lot of major things underway that are causing people a great deal of stress. I left for a trip, a combination of needing to raise money and I had gotten married earlier that year and had not had a vacation or honeymoon. It was kind of a combined financing trip and honeymoon. Also not a great idea.

在重大事项推进引发团队高压时期离岗实属不智。当时出行是迫于融资需求，加之同年新婚却未度蜜月。这次融资之旅兼作蜜月，实非明智之举。

I got removed as CEO of PayPal because I wanted to do a bunch of things that seemed extremely risky. I think they would have worked out, but at a time when companies were dropping like flies, I was proposing we do all these things that sound risky—it was much too scary for the rest of the team.[457]

更多资源 https://mirrorsite.org

我失去PayPal CEO职位，只因主张实施多项极具风险的计划。这些方案本可奏效，但在企业大批倒闭的时期，我提出的方案听上去风险极大——令团队其他成员胆战心惊。[457]

I didn't agree with their conclusion, but I understood why they took the action they did. Peter, Max, David, and the other guys are smart people with the right motivations. They did what they thought was right, for the right reasons. The reasons weren't valid in my opinion but it's hard to argue with the ultimate outcome, which was positive.

我不同意他们的结论，但理解其行动缘由。彼得、马克斯、戴维等人都动机纯正且才智过人。他们秉持正确初衷，做出了自认正确的抉择。在我看来其理由并不充分，但积极的结果无可辩驳。

It would be easy to be bitter and hate them forever, but the better course of action is to turn the other cheek. I put a lot of effort into making things good between us, and they became good. I invested in some of Peter's companies, including Founders Fund, which is made up primarily of former PayPal people. Peter, who replaced me as CEO, later invested in SpaceX.[458]

耿耿于怀易，宽容大度难，后者方为上策。我倾力修复关系，终使关系重归和睦。我投资了彼得多家企业，包括主要由前PayPal成员组成的创始人基金。继任CEO的彼得后来投资了太空探索技术公司。[458]

> Life is too short for long-term grudges.[459]
>
> 生命短暂，不应为长期积怨所困。[459]

Q: What was the exit like?

问：退出过程如何？

更多资源 https://mirrorsite.org

In about February of 2002, PayPal went public. I think we were the only internet company to go public in the first part of 2002. It went reasonably well, although I can imagine we set a record on SEC rewrites. This was right around the time of Enron and other corporate scandals, so they put us through the wringer.[460]

2002年2月，PayPal成功上市。我认为我们是2002年第一季度唯一上市的互联网公司。过程还算顺利，尽管我猜我们创下了SEC重写次数的记录。当时正值安然事件及其他公司丑闻爆发期，监管机构因此对我们进行了严苛审查。[460]

It was a tough, long-running battle between PayPal and eBay's payment system, and it was certainly challenging. There were times it felt like trying to win a land war in Asia. They got to set the ground rules. It was like trying to beat Microsoft inside their own operating system. It took a lot of effort to beat eBay in their own system. One of the long-term risks for PayPal was eBay would one day prevail. One way to retire that risk was to sell to eBay.[461]

PayPal与eBay支付系统之间展开了艰苦而旷日持久的较量，这无疑充满挑战。某些时刻感觉就像试图在亚洲大陆战中取胜——规则制定权始终掌握在对方手中。这如同试图在微软自家操作系统内击败微软。要在eBay的体系内战胜他们，需要付出巨大努力。PayPal面临的长期风险之一，是eBay终将占据主导地位。消除该风险的一种方式就是将公司出售给eBay。[461]

In October 2002, we struck a deal to sell PayPal to eBay for about $4.5 billion.[462]

2002年10月，我们达成协议将PayPal出售给eBay，交易金额约45亿美元。[462]

I could go and buy one of the islands of the Bahamas and turn it into my personal fiefdom, but I am much

更多资源 https://mirrorsite.org

more interested in trying to build and create a new company.

我本可以买下巴哈马群岛的某个岛屿，将其变成我的私人王国，但我更热衷于尝试创建一家新公司。

I haven’t spent my winnings.

我并未动用这笔意外之财。

I’m going to put almost all of it back into a new game.[463]

我准备将几乎所有资金重新投入新的事业。[463]

382 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

382 可汗与马斯克，《特斯拉汽车公司与　太空探索技术公司首席执行官专访》

383 “Third Row Tesla Podcast, Episode 7.”

383 《特斯拉第三排播客，第 7期》

384 “Elon Musk, Charlie Rose Interview (2009).”

384 "埃隆·马斯克，查理·罗斯专访(2009)。"

385 “Third Row Tesla Podcast, Episode 7.”

385 "特斯拉第三排播客，第 7期。"

386 “Third Row Tesla Podcast, Episode 7.”

386 "特斯拉第三排播客，第 7期。"

387 “Third Row Tesla Podcast, Episode 7.”

387 "特斯拉第三排播客，第 7期。"

388 “Third Row Tesla Podcast, Episode 7.”

更多资源 https://mirrorsite.org

388 《特斯拉第三排播客，第7章节》

389 Musk (@elonmusk), X account.

389 马斯克（@elonmusk），X 账户

390 “Third Row Tesla Podcast, Episode 7.”

390 《特斯拉第三排播客，第7章节》

391 “Third Row Tesla Podcast, Episode 7.”

391 “特斯拉第三排播客，第 7期。”

392 “Elon Musk's Vision for the Future.”

392 “埃隆·马斯克的 未来愿景”

393 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

393 可汗与马斯克，“特斯拉汽车首席执行官与 太空探索技术公司创始人访谈”

394 “Elon Musk: 10X Every 6 Months.”

394 “埃隆·马斯克：每6 个月实现十倍增长。”

395 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

395 可汗与马斯克，“特斯拉汽车首席执行官兼 太空探索技术公司创始人。”

396 “Third Row Tesla Podcast, Episode 7.”

396 “特斯拉第三排播客，第 7章节。”

397 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

397 可汗与马斯克，《特斯拉汽车首席执行官与 太空探索技术公司》

398 “Elon Musk's Vision for the Future.”

398 《埃隆·马斯克的未来愿景》

399 “Elon Musk's Vision for the Future.”

399 《埃隆·马斯克的未来愿景》

400 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

400 可汗与马斯克，“特斯拉汽车首席执行官兼 太空探索技术公司首席执行官。”

401 “Elon Musk's Vision for the Future.”

更多资源 https://mirrorsite.org

401 “埃隆·马斯克的未来 愿景。”

402 “Elon Musk's Vision for the Future.”

402 “埃隆·马斯克的未来 愿景。”

403 “Jeff Skoll Talks with Elon and Kimbal Musk.”

403 “杰夫·斯科尔对话埃隆与金巴尔 马斯克。”

404 “Third Row Tesla Podcast, Episode 7.”

404 “特斯拉第三排播客，第 7期。”

405 “Elon Musk: Digital Superintelligence,” Y Combinator.

405 “埃隆·马斯克：数字超级智能，” Y Combinator。

406 “Elon Musk: Digital Superintelligence,” Y Combinator.

406 “埃隆·马斯克：数字超级智能”，Y Combinator。

407 Elon Musk and Maurice J. Fitzgerald, Interactive Network Directory Service with Integrated Maps and Directions, US Patent 5,944,769, filed November 8, 1996, and issued August 31, 1999, https://patents.justia.com/patent/5944769#claims.

407 埃隆·马斯克与莫里斯·J·菲茨杰拉德，《集成地图与方向的交互式网络目录服务》，美国专利号 5,944,769，1996 年 11 月 8 日申请，1999 年 8 月 31 日授权，https://patents.justia.com/patent/5944769#claims。

408 “Third Row Tesla Podcast, Episode 7.”

408 “特斯拉第三排播客，第 7期。”

409 “Third Row Tesla Podcast, Episode 7.”

409 “特斯拉第三排播客，第 7期。”

410 “Musk's 2003 Stanford Lecture.”

410 “马斯克2003年斯坦福大学 讲座。”

411 “Musk's 2003 Stanford Lecture.”

411 “马斯克的2003年斯坦福大学 演讲。”

412 “Musk's 2003 Stanford Lecture.”

412 “马斯克的2003年斯坦福大学 演讲。”

413 “Third Row Tesla Podcast, Episode 7.”

更多资源 https://mirrorsite.org

413 “特斯拉第三排播客，第 7期。”

414 “Third Row Tesla Podcast, Episode 7.”

414 “特斯拉第三排播客，第 7期。”

415 “Musk's 2003 Stanford Lecture.”

415 “马斯克2003年斯坦福大学 演讲。”

416 “Third Row Tesla Podcast, Episode 7.”

416 “特斯拉第三排播客，第 7期。”

417 “Third Row Tesla Podcast, Episode 7.”

417 《特斯拉第三排播客》第 7集。

418 “Elon Musk Answers Your Questions,” SXSW 2018.

418 “埃隆·马斯克回答你的问题”，2018年 西南偏南大会。

419 “Elon Musk Answers Your Questions,” SXSW 2018.

419 “埃隆·马斯克回答你的问题”，2018年 西南偏南大会。

420 “Third Row Tesla Podcast, Episode 7.”

420 “特斯拉第三排播客，第 7章节。”

421 “Musk's 2003 Stanford Lecture.”

421 “马斯克的2003年斯坦福大学 演讲。”

422 Soni, *The Founders.*

422 索尼，《创始人》。

423 “Musk's 2003 Stanford Lecture.”

423 “马斯克2003年斯坦福大学 讲座”

424 Isaacson, *Elon Musk.*

424 沃尔特·艾萨克森《埃隆 马斯克》

425 “Third Row Tesla Podcast, Episode 7.”

425 “特斯拉第三排播客第 7期”

426 “Elon Musk: Digital Superintelligence,” Y Combinator.

更多资源 https://mirrorsite.org

426 「埃隆·马斯克：数字超级智能」，Y Combinator。

427 “Third Row Tesla Podcast, Episode 7.”

427 「特斯拉第三排播客，第 7集」

428 “Third Row Tesla Podcast, Episode 7.”

428 「特斯拉第三排播客，第 7集」

429 Fridman and Musk, “Lex Fridman Podcast #252.”

429 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

430 Musk, “Caltech Commencement Speech.”

430 马斯克，《加州理工学院毕业演讲》

431 Musk, “Caltech Commencement Speech.”

431 马斯克，《加州理工学院毕业演讲》

432 “Third Row Tesla Podcast, Episode 7.”

432 《特斯拉第三排播客，第7章》

433 Soni, *The Founders*.

433 索尼, 创始人 们.

434 Soni, *The Founders*.

434 索尼, 创始人 们.

435 “Elon Musk: Digital Superintelligence,” Y Combinator.

435 “埃隆·马斯克：数字超级智能,” Y Combinator.

436 Musk, “Caltech Commencement Speech.”

436 马斯克，《加州理工学院毕业典礼 演讲》

437 Urban, “The Cook and the Chef.”

437 厄本，《厨师与 主厨》

438 “Musk's 2003 Stanford Lecture.”

438 《马斯克2003年斯坦福大学 讲座》

439 “Musk's 2003 Stanford Lecture.”

更多资源 https://mirrorsite.org

439 “马斯克2003年斯坦福大学 演讲”

440 “Musk's 2003 Stanford Lecture.”

440 “马斯克2003年斯坦福大学 演讲”

441 “The Mind Behind Tesla, SpaceX, SolarCity.”

441 “特斯拉、太空探索技术公司与太阳城公司背后的智慧”

442 Soni, *The Founders.*

442 索尼，《创始人》

443 “Third Row Tesla Podcast, Episode 7.”

443 “特斯拉第三排播客，第 7集。”

444 “Third Row Tesla Podcast, Episode 7.”

444 “特斯拉第三排播客，第 7集。”

445 “Pando Monthly Fireside Chat.”

445 “Pando月度炉边 谈话。”

446 “Third Row Tesla Podcast, Episode 7.”

446 《特斯拉第三排播客》第7章

447 “Pando Monthly Fireside Chat.”

447 《Pando月度炉边谈话》

448 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

448 可汗与马斯克，《特斯拉汽车公司与太空探索技术公司首席执行官》

449 “CHM Revolutionaries: An Evening with Elon Musk.”

449 “计算机历史博物馆革新者：与埃隆 马斯克共度夜晚。”

450 “Musk's 2003 Stanford Lecture.”

450 “马斯克2003年斯坦福大学 讲座。”

451 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

451 可汗与马斯克，“特斯拉汽车首席执行官与 太空探索技术公司。”

452 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

更多资源 https://mirrorsite.org

452 可汗与马斯克，《特斯拉汽车首席执行官及太空探索技术公司首席执行官》

453 “Musk's 2003 Stanford Lecture.”

453 《马斯克2003年斯坦福大学讲座》

454 “CHM Revolutionaries: An Evening with Elon Musk.”

454 《计算机历史博物馆革新者：与埃隆·马斯克共度之夜》

455 “CHM Revolutionaries: An Evening with Elon Musk.”

455 “计算机历史博物馆革新者：与埃隆·马斯克共度之夜”

456 “Elon Musk on His PayPal Firing,” Inc. 5000.

456 “埃隆·马斯克谈被PayPal解雇事件”，Inc.5000

457 “Third Row Tesla Podcast, Episode 7.”

457 “特斯拉第三排播客，第7期”

458 “Elon Musk on His PayPal Firing,” Inc. 5000.

458 《埃隆·马斯克谈PayPal解雇事件》，公司5000。

459 Max Chafkin, “Entrepreneur of the Year, 2007: Elon Musk,” *Inc.*, December 1, 2007, https://www.inc.com/magazine/20071201/entrepreneur-of-the-year-elon-musk.html.

459 马克斯·查夫金，《2007年度企业家：埃隆·马斯克》，公司，2007年12月1日，https://www.inc.com/magazine/20071201/entrepreneur-of-the-year-elon-musk.html。

460 “Musk's 2003 Stanford Lecture.”

460 “马斯克的2003年斯坦福大学 讲座”

461 “Pando Monthly Fireside Chat.”

461 “潘多月度 炉边谈话”

462 “Musk's 2003 Stanford Lecture.”

462 “马斯克的2003年斯坦福大学 讲座”

463 Isaacson, *Elon Musk.*

463 沃尔特·艾萨克森，埃隆 马斯克。

更多资源 https://mirrorsite.org

BUILDING TESLA

打造特斯拉

Accelerating the removal of hydrocarbons from the crust and placing them in the atmosphere is unwise. This is one of the biggest problems of the twenty-first century.

加速开采地壳中的碳氢化合物并将其排入大气是不明智之举。这是二十一-世纪最重大的问题之一。

Hopefully this transition to sustainable energy occurs before it’s too late.[464]

希望在为时未晚之前实现向可持续能源的转型。[464]

更多资源 https://mirrorsite.org

THE MISSION TO PROTECT THE PLANET

守护地球的使命

> There’s no way we can conserve our way to a good future. We have to make energy sustainable.[465]
>
> 我们不可能仅凭节约手段创造美好未来。我们必须实现能源的可持续性。[465]

Q: Why is the mission of Tesla so important to you?

问：为何特斯拉的使命对你至关重要？

The overarching purpose of Tesla is to help expedite the move from a mine-and-burn hydrocarbon economy toward a solar-electric economy, which I believe to be the primary, but not exclusive, sustainable solution.[466]

特斯拉的核心目标是加速推动经济从开采-燃烧碳氢化合物模式向太阳能-电力模式转型，这虽非唯一但实为主要可持续解决方案。[466]

Energy output is the foundation of the economy, just like sunlight is the foundation of the ecosystem. To a first approximation, a country’s goods and services production will be proportionate to its energy output.[467]

能源产出是经济根基，犹如阳光乃生态系统基石。粗略估算，国家商品服务产出将与其能源产能成正比。[467]

By definition, we must at some point achieve a sustainable energy economy or we will run out of fossil fuels to burn and civilization will collapse. Given that we *must* get off fossil fuels anyway, and that *virtually all*

更多资源 https://mirrorsite.org

scientists agree dramatically increasing atmospheric and oceanic carbon levels is insane…the faster we achieve sustainability, the better.[468]

本质上，人类必须在某个时间点建立可持续能源经济，否则化石燃料耗尽之日即是文明崩溃之时。既然我们必须摆脱化石燃料，且几乎所有科学家都认为剧增大气与海洋碳元素含量实属疯狂　实现可持续转型的速度越快越好。[468]

I don't have any fundamental dislike of hydrocarbons. I simply look at the future and say, "What is the thing that will actually work?" Using a nonrenewable resource obviously will not work.[469]

我对碳氢化合物并无根本性的反感。我展望未来时思考的是：'真正可行的方案是什么？'依赖不可再生资源显然行不通。[469]

There are time extensions on the game, but the game is going to end eventually. That should be obvious. If we rely on nonrenewables, it's like we're stuck in a room where the oxygen is gradually depleting. We want to get out of that room. The sooner we get out of that room, the better.[470]

游戏或许能延时，但终将结束。这是不言而喻的。若依赖不可再生资源，就如同困在氧气渐竭的密闭空间。我们必须逃离这个困境。越早脱困，越为有利。[470]

Q: How do you respond to people who don't see the problem with extraction?

问：如何回应那些不认为开采存在问题的人？

It is dangerous to be extracting vast quantities of hydrocarbons from deep within the earth and putting them in the atmosphere. Sooner or later, something bad will happen. There are a lot of people, particularly in the US, who are vehemently against electric cars and sustainable energy. It's quite difficult to reason with them.

更多资源 https://mirrorsite.org

从地球深处大量开采碳氢化合物并排入大气，这种行为极其危险。灾难迟早会发生。许多人（尤其在美国）对电动汽车和可持续能源持强烈反对立场。与他们理性沟通相当困难。

They'll say, "Well, some scientists don't think climate change is a problem."[471]

他们会说："有些科学家不认为气候变化是个问题。"[471]

> You can find some small number of people that will disagree with anything.
>
> 你总能找到少数人反对任何观点。

This reminds me of the tobacco industry. For the longest time you'd see ads where they claimed tobacco was healthy for you. It's hard to believe these days, but it's true.

这让我想起烟草行业。在很长一段时间里，你会看到广告宣称烟草有益健康。如今难以置信，但确有其事。

There were reports where there seemed to be a correlation between lung cancer and smoking, but tobacco companies would say, "Our scientists have conducted experiments and they show no relation at all!" It's complete nonsense.[472]

曾有报告显示肺癌与吸烟似乎存在关联，但烟草公司却说：'我们的科学家进行过实验，证明毫无关联！'这完全是一派胡言。[472]

Almost any reasonable scientist would say, "Yes, of course smoking causes lung cancer and all sorts of other bad things. Not definitively but it's extremely likely." Yet the tobacco industry would still say, "Scientists disagree!" because 1 or 2 percent of the scientific community didn't feel that way.

更多资源 https://mirrorsite.org

几乎所有理性科学家都会说：‘当然，吸烟会导致肺癌及其他各种危害。’虽非绝对定论，但可能性极高。”然而烟草业仍宣称：‘科学家意见不一！’只因科学界中1%到2%的人不认同。

The public just hears “Scientists disagree!” rather than “99 percent of scientists think the other 1 percent are stupid.”[473]

公众只听到‘科学家意见不一！’，而非‘99%的科学家认为另外1%的人很愚蠢’。”[473]

The question isn’t, “Can you prove we’re making the planet warmer?” but, “Can you prove we’re not?” And you can’t.[474]

关键问题并非'能否证明我们在导致全球变暖'，而是'你能否证明我们没有？'而后者你无法证明。[474]

It makes me mad when smart, ethical scientists are accused of publishing climate papers for “grant money.” They earn peanuts compared to their other opportunities and give that up to help the world. But their accusers earn billions by slowing down the growth of clean energy. Who is more credible?[475]

当正直睿智的科学家因发表气候论文被诬陷追求'经费'时，我倍感愤怒。相比其他职业选择，他们收入微薄，却甘愿为拯救世界放弃高薪。但指控者通过阻碍清洁能源发展攫取百亿利润。谁的立场更具公信力？[475]

People often believe things inversely proportional to the evidence. It’s so strange.

人们常对证据越匮乏的观点越坚信不疑，这实在荒谬。

更多资源 https://mirrorsite.org

> Given a set of possible explanations, why pick the extremely unlikely one?[476]
>
> 面对多重可能性解释，为何偏要选择那个概率微乎其微的选项？[476]

Q: So it’s not too late to turn things around?

问：那么扭转局面尚未为时过晚？

Humanity will solve sustainable energy if we continue to push hard. The future is bright for cheap, abundant energy. It will be possible to use that energy to pull carbon out of the atmosphere. It takes a lot of energy to do that carbon capture, because putting it into the atmosphere releases energy. To pull it out, you need to use a lot of energy.

只要人类持续强力推进，终将攻克可持续能源难题。廉价充沛的能源未来前景可期。利用该能源实现大气碳元素提取将成为可能。碳捕捉需消耗巨量能源，因其排放过程本身释放了能量。要提取碳元素，必须投入大量能源。

But if we’ve got a lot of sustainable energy from wind and solar, we can sequester carbon. We can reverse the CO2 parts per million of the atmosphere and oceans and restore the climate.[477]

若能从风能与太阳能获取充足可持续能源，我们就能实现碳元素封存。我们可逆转大气与海洋中的二氧化碳浓度，恢复气候平衡。[477]

> I donated $100 million to a prize for the best carbon capture technology.

更多资源 https://mirrorsite.org

> 我捐资1亿美元设立奖项，奖励最佳碳捕获技术。

We can create as much fresh water as we want. Earth is mostly water. We should call Earth “Water.” It’s 70 percent water by surface area. We just happen to be on the small bit that’s land. With energy, we can turn ocean water into fresh water or irrigation water at low cost.[478]

淡水可随心所需制造。地球主体成分是水。地球应改称'水星'——其表面70%被水覆盖。人类恰巧栖居在陆地这一小块区域。借助能源技术，我们能低成本将海水转化为淡水或灌溉用水。[478]

When you burn fossil fuels, there’s all these side reactions and toxic gasses of various kinds. A lot of little particulates that are bad for your lungs. All sorts of bad things are happening, which will go away with sustainable energy. The sky will be cleaner and quieter. The future is going to be good.[479]

化石燃料燃烧会引发多重副反应并释放各类有毒气体。大量危害肺部的细微颗粒物随之产生。这些危害都将随可持续能源普及而消弭。天空将重现澄澈宁静。未来终将美好。[479]

The purpose of Tesla was, and remains, accelerating the use of sustainable energy, so we can imagine far into the future and life is still good. That’s what “sustainable” means. It’s not some silly hippie thing—it matters for everyone.[480]

特斯拉创立至今的核心使命，始终是加速可持续能源应用，确保人类展望久远未来时，生活依然美好如初。这就是'可持续'的真正含义。这绝非嬉皮士式的儿戏——它对每个人都至关重要。[480]

更多资源 https://mirrorsite.org

GOING ALL IN, AGAIN (PAYPAL EARNINGS INTO TESLA)

全力以赴再出发（将PayPal收益投入特斯拉）

> When you have a big technology change, it tends to come from new companies.[481]
>
> 当重大技术变革来临时，往往源自新兴企业。[481]

A lot of entrepreneurial talent and financing goes to the internet. Other sectors like automotive, solar, and space don't see new entrants. Not a lot of entrepreneurs go into those areas, and not a lot of capital goes into those startups.[482]

大量创业人才与资金涌入互联网领域。汽车、太阳能、太空等其他行业却鲜有新进入者。投身这些领域的企业家寥寥无几，流向这些初创企业的资本也屈指可数。[482]

This is a problem because innovation tends to come from new entrants to an industry. This is Schumpeter's idea of creative destruction. In an oligopoly, no one is forced to innovate.[483] New entrants drive innovation more than anything, which is why I have devoted my efforts to building new companies in those industries.[484]

This is a problem because innovation tends to come from new entrants to an industry. This is Schumpeter's idea of creative destruction. In an oligopoly, no one is forced to innovate. | 这构成了严重问题，因为行业创新往往由新入局者推动。这正是熊彼特提出的'创造性破坏'理论。在寡头垄断格

更多资源 https://mirrorsite.org

局下，无人被迫创新。[483] 新进入者才是创新的核心驱动力，这正是我致力于在这些行业创建新企业的根本原因。[484]

These industries require quite a bit of capital to get going. My proceeds from PayPal after tax were about $180 million. I thought I would allocate half to SpaceX, Tesla, and SolarCity. I thought that should be fine. I'd have $90 million left, and that's…a lot, you know?[485]

这些行业需要相当规模的启动资金。我在PayPal的税后收益约1.8亿美元。我原计划将一半资金分配给太空探索技术公司、特斯拉和太阳城公司，认为这样应该没问题。这样我还能剩下9000万美元，这...可不是个小数目，对吧？[485]

But things cost more and took longer than I thought.[486] Each one ended up costing double what I expected. I thought SpaceX would need $50 million. Tesla, I thought, would need $25 million, maybe $30 million. SolarCity… actually went really well.[487]

But things cost more and took longer than I thought. | 但实际开销远超预期，耗时也更长。[486] 每项最终花费都达到了我预估的两倍。我原以为太空探索技术公司只需5000万美元。特斯拉预估2500万，最多3000万美元就够了。太阳城公司...进展其实相当顺利。[487]

I ended up putting $10 million into Solar City, $70 million into Tesla, and $100 million into SpaceX. I literally had to borrow money for rent. It was a close call.[488]

结果我向太阳城公司投入1000万，特斯拉7000万，太空探索技术公司1亿。最后连房租都得借钱支付，真是惊险过关。[488]

更多资源 https://mirrorsite.org

BUILDING THE FIRST PROTOTYPE

打造首台原型

I first realized all vehicles would be electric in the early nineties, way before Tesla started. I was studying physics in my sophomore year in college; it was obvious to me even then.[489]

早在九十年代初特斯拉创立之前，我就意识到所有交通工具终将电动化。当时我正在大学攻读物理学；即便在那时，这个趋势对我来说已显而易见。[489]

Getting the timing right was important. Lithium-ion batteries were the critical breakthrough needed for compelling electric cars. I knew it became possible to start Tesla because we went from the energy density of lead acid batteries to lithium-ion batteries—about a 4x energy density improvement. If you had a sixty-mile range with a lead-acid battery, you would have about one-hundred-forty-mile range with lithium-ion for the same weight.

把握时机至关重要。锂-离子电池是实现高性能电动汽车的关键突破。我之所以知道有可能创立特斯拉，是因为我们从铅酸电池的能量密度发展到了锂-离子电池——能量密度提升了约4倍。如果铅酸电池只能提供六十-英里的续航，那么在相同重量下，锂-离子电池则能提供约一百四十-英里的续航里程。

A company called AC Propulsion had built a prototype, which had similar specs to what we eventually brought to market as the first Tesla Roadster. It was cool to see it in action, working. I tried hard to convince those guys to commercialize their car but they just did not want to do it.

一家名为AC Propulsion的公司曾开发过一款原型车，其规格与我们最终推向市场的首款特斯拉Roadster非常相似。亲眼目睹其运行令人印象深刻。我竭力说服他们将这款车商业化，但他们始终不愿行动。

更多资源 https://mirrorsite.org

The car they wanted to make was like an electric Scion. I told them, “You guys, nobody’s gonna pay $70,000 for an electric Scion. This is not gonna work. You will sell like fourteen of these things.”

他们计划打造的车型类似于电动Scion。我直言不讳：'各位，没人会花七万美元买电动Scion，这绝对行不通。你们顶多卖出十四辆这种车。'

Though I also said, “Even though I think this is the dumbest idea ever, I will fund one tenth of it if you can find nine other people.”[490]

不过我也表态：'虽然我认为这主意蠢到家，但只要你们能找到另外九位投资人，我愿承担十分之一的资金。'[490]

I thought it would fail, but at least it was something. They didn’t actually get it off the ground. Eventually I said, “If you guys are not going to commercialize this, do you mind if I do?”[491]

我料定它会失败，但至少算个尝试。实际上他们未能启动项目。最终我摊牌：'如果你们不打算商业化，那由我来接手如何？'[491]

> We made so many mistakes in the beginning of Tesla. Almost every decision we made was wrong.[492]
>
> 特斯拉初创期我们犯过太多错误，几乎每个决策都出现偏差。[492]

The founding principles of Tesla were basically completely wrong. The premise was, “It’s not gonna be that hard! We’ll take the Lotus Elise, a nice lightweight car, and we’ll take AC Propulsion’s drive unit technology, put ’er together, and we’ll have an electric car! It’ll be great!”

特斯拉的创立原则基本上完全错误。当时的设想是：'这不会太难！我们拿路特斯Elise这种轻量化跑车，加上AC Propulsion的驱动单元技术，组装起来就能造出电动车！肯定很棒！'

更多资源 https://mirrorsite.org

Except the AC Propulsion technology could not be industrialized. It was handcrafted electronics. In hot or cold weather, it would respond differently or not at all. It was impossible to scale this technology. You could only have finicky, individually made, superexpensive prototypes.

但AC Propulsion的技术无法实现工业化量产。那只是手工打造的电子元件。在酷热或严寒环境下，系统要么反应异常要么完全失灵。这项技术根本无法规模化。最终只能造出娇贵无比、手工制造、价格高昂的原型车。

I remember in the early days giving a test ride to Larry Page and Sergey Brin, whom I've known for a long time. There was some bug in the system and, damn it, the car would only go ten miles an hour. I was in the passenger seat saying, "Guys, I swear, it goes a lot faster than this."

我记得早期曾给认识多年的拉里·佩奇和谢尔盖·布林试乘。系统出了故障，该死的，车速只能跑到十英里每小时。我坐在副驾上解释：'伙计们，真的，它绝对能跑得更快。'

They were kind enough to put a little investment into the company, despite the world's worst demo.[493]

尽管我们做了史上最糟糕的演示，他们还是慷慨地向公司投入了一笔小额资金。[493]

It was just a flat-out burning dumpster fire of stupidity. One example: The chassis had to be redesigned to fit the battery pack and became 40 percent heavier. This invalidated the crash testing Lotus had done.[494]

这简直就是彻头彻尾燃烧着的愚蠢垃圾箱。 一个例子：底盘必须重新设计以适应电池组，结果重量增加了40%。 这使得路特斯之前完成的碰撞测试全部作废。[494]

We ended up using none of the AC Propulsion technology. Something that looks cool and works as an individual prototype does not necessarily scale. Eventually maybe 7 percent of the parts of the original Tesla Roadster were

更多资源 https://mirrorsite.org

common with the Lotus Elise. It would have been much smarter to start with a clean-sheet design and not try to modify something else.[495]

最终我们完全没有采用AC Propulsion的技术。某个作为独立原型看起来很酷的东西，未必能够实现量产规模。最终，原始特斯拉Roadster与路特斯Elise的通用部件可能只有7%。当初采用全新设计而非改造现有车型，会明智得多。[495]

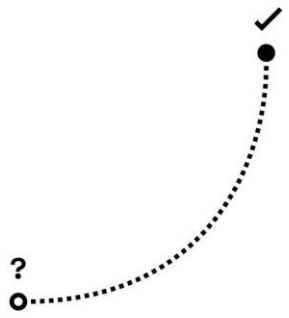
I was going to start an electric vehicle (EV) company with JB Straubel based on the AC Propulsion prototype. When I asked AC Propulsion if it was okay to do that, they said, “There are some other people who want to create an EV company; would you like to join forces with them?” I said, “OK.” That was a huge mistake. JB and I should have just started the company ourselves. My default inclination is to start things from scratch, even more so after this experience.[496]

我原本计划基于AC Propulsion的原型，与JB Straubel共同创立一家电动汽车（EV）公司。当我询问AC Propulsion是否可以这样做时，他们表示：“还有其他人也想创办一家电动汽车公司；您愿意与他们联手吗？”我回答：“好的。”这成了重大失误。JB和我本应独立创办这家公司。我的本能倾向是从零开始创业，这次经历后这种倾向更加强烈。[496]

The most important thing is to start somewhere, be prepared to question your assumptions, fix what you did wrong, and adapt to reality.[497]

最关键的是迈出第一步，随时质疑既有假设，修正错误决策，并顺应现实发展。[497]

更多资源 https://mirrorsite.org



关键是要迈出第一步，
准备好质疑你的假设，修正你的错误，并适应现实。

更多资源 https://mirrorsite.org

BECOMING TESLA'S CEO

成为特斯拉首席执行官

The actual error was me trying to have my cake and eat it too: I just wanted to work on the technology and the product. I thought someone else could be the CEO and run the business, because I just like working on technology, product, and design. I was also doing SpaceX at the time, and our rockets were exploding.

真正的错误在于我试图鱼和熊掌兼得：我只想专注于技术和产品开发。我以为可以让他人担任首席执行官管理公司，因为我只热衷于钻研技术、产品和设计。当时我还经营着太空探索技术公司，我们的火箭正接连爆炸。

I had always wanted to build an electric car company. I thought this is how I could have my cake and eat it too. That was a huge mistake and fundamentally a moral error. When I joined, there were no employees. There was no intellectual property. There was no prototype, no nothing.[498]

创办电动汽车公司一直是我的夙愿。我以为这样就能鱼与熊掌兼得。这实属重大失误，本质上是道德层面的错误。我加入时公司尚无任何员工。毫无知识产权储备。既无原型更无他物。[498]

I had provided about 95 percent of the money for Tesla, so I could become CEO anytime I wanted. And in the end, I had to frickin' become CEO of Tesla. I didn't want to be, but it was either that or the company was going to die.[499]

特斯拉95%的资金由我提供，出任CEO本可随时为之。最终我不得不接任特斯拉CEO。虽非所愿，但要么掌舵要么公司消亡。[499]

更多资源 https://mirrorsite.org

> I never wanted to be a CEO, but I learned you could not truly be the chief technology or product officer unless you were the CEO.[500]
>
> 我本无意担任CEO，但深知若非此位则无法真正掌控技术或产品主导权。[500]

Being CEO of two startups at the same time was not appealing. It shouldn't be appealing, by the way, for anyone thinking it was a good idea. It was a terrible idea.[501]

同时执掌两家初创企业毫无吸引力。顺便提醒，若有人认为此举可取实属谬见——这分明是个糟糕透顶的主意。[501]

If you're a CEO of a company, the chore level is high, and if you don't do your chores then the company goes to hell. Frankly, I hate doing chores—who doesn't? There's a whole bunch of personnel and legal issues: things I don't find enjoyable to work on, but if I don't work on them, the company suffers. The sheer volume of work is insane.[502]

身为公司掌舵者，日常事务繁重。若履职不力，企业必将走向覆灭。坦白说，我讨厌处理杂务——谁不是呢？存在大量的人事和法律问题：这些工作我毫无兴趣，但若置之不理，公司将遭受损失。工作量之大简直令人发狂。[502]

The perception of me as a businessperson is fine, but my time is spent almost entirely with the engineering team. I'm a physics guy, an engineer. I'd prefer to be working on products. I do the business stuff because you have to do the business stuff. If you don't do the business stuff, somebody else could do it for you and then you could be in trouble.[503]

人们将我视为商人无可厚非，但我的时间几乎全投入在工程团队中。我是物理学背景出身，是工程师。我更愿意投身于产品开发。处理商

更多资源 https://mirrorsite.org

业事务实属必要，所以我才会参与其中。若不亲自处理商业事务，他人可能越俎代庖，届时你将陷入困境。[503]

I have a habit of biting off more than I can chew and just sitting there with chipmunk cheeks.[504]

我惯于贪多嚼不烂，时常像塞满果颊的松鼠般呆坐原地。[504]

更多资源 https://mirrorsite.org

SEQUENCED STRATEGY OF TESLA

特斯拉的分阶段战略

Tesla is focused on making electric cars more affordable, which is tough. You need high volume to make cars affordable. When we started, other car companies made a lot more cars, so they got much better economies of scale. As we build more cars in higher volume, we make electric cars available to a wider range of people at lower cost.[505]

特斯拉致力于实现电动汽车的普及化，这极具挑战性。唯有实现规模化生产，才能达成汽车价格亲民的目标。我们起步时，其他汽车公司的产量要大得多，因此获得了更显著的规模经济效应。随着我们扩大生产规模，能以更低成本让更广泛人群用上电动汽车。[505]

The first version of a product has both a new-technology problem and a low-volume problem. You want to make your mistakes at a small scale, work the bugs out of the system, then reach for scale.[506]

产品的初代版本同时面临新技术问题和小批量生产问题。应在小规模阶段试错，排除系统漏洞后再追求规模化。[506]

With a new product, the first thing engineers try to do is make it work. After you make it work, then you optimize and optimize and optimize.[507]

对于新产品，工程师的首要目标是实现基本功能。实现基本功能后，就要持续优化、不断优化、反复优化。[507]

The master plan was:

总体规划是：

1. Build a sports car.

更多资源 https://mirrorsite.org

1. 制造跑车
2. Use that money to build an affordable car.
3. 用其利润打造经济型汽车
4. Use that money to build an even more affordable car.
5. 再用利润制造更经济实惠的车型

(While doing above, also provide zero-emission electric power generation options.)[508]

(执行上述计划时，同步提供零排放发电方案)[508]

We had to start off with step one, because it was all I could afford with what I made from PayPal. I thought our chances of success were so low, I didn't want to risk anyone's funds but my own in the beginning.[509]

我们必须从第一步开始，因为这是我用PayPal赚来的钱所能负担的全部。当时我认为成功概率极低，因此初期不愿让他人资金冒险，除了自己的。[509]

The list of successful car startups is short. The number of American car companies that haven't gone bankrupt is a grand total of two: Ford and Tesla. Starting a car company is idiotic, and an electric car company is idiocy squared.[510]

成功的汽车初创企业屈指可数。未破产的美国汽车企业总共只有两家：福特和特斯拉。创办汽车公司本已愚蠢，创办电动汽车公司更是愚蠢的平方。[510]

> The idea is to drive to mass market as rapidly as possible, at the pace technology matures.[511]
>
> 目标是在技术成熟的节奏下，以最快速度推向大众市场。[511]

更多资源 https://mirrorsite.org

As a little startup building a car, there was no way we could afford a giant plant to make hundreds of thousands of cars a year. That's the kind of volume you need to make cheap cars, and that plant would cost a billion dollars we didn't have.

作为一家制造汽车的小型初创企业，我们根本无力承担年产数十万辆的大型工厂。只有达到这种规模才能生产廉价汽车，而建设这种工厂需要十亿美元资金——我们当时并不具备。

Our first car was a sports car, not because we think the world lacks a sports car, but because it was the right entry point for the market. If you have a new technology, the right place to enter is high unit-cost, low unit-volume.[512]

我们的首款车型是跑车，并非认为世界缺少跑车，而是因为这是最佳的市场切入点。若掌握新技术，最佳切入点在于高单价、低销量的领域。[512]

A low-volume car means a much smaller, simpler factory with most things done by hand. Without economies of scale, anything we built would be expensive whether it was an economy sedan or a sports car. Some people would be prepared to pay a high price for a sports car. No one would pay $100K for an electric Honda Civic, no matter how cool it looked.[513]

小批量汽车生产意味着需要更精简、简易的工厂，多数工序依赖手工完成。缺乏规模经济支撑时，无论经济型轿车还是跑车，我们的产品都会价格高昂。有人愿意为跑车支付溢价，但没人会花10万美元购买电动本田思域——无论它多么酷炫。[513]

When a new cell phone or a new laptop comes out, they tend to be expensive at first, because they're figuring out the issues and it takes time to optimize. Over time, with scale, that new technology becomes cheaper and cheaper.[514]

更多资源 https://mirrorsite.org

新款手机或笔记本电脑上市初期往往价格昂贵，因其需解决初期问题，且技术优化需要时间沉淀。随时间推移，伴随规模扩大，新技术会变得越来越便宜。[514]

That is the unique and important thing Tesla accomplished. It is not the design of an electric vehicle, an electric vehicle prototype, or even low-volume production of a car. The hard part is not creating a prototype or going into limited production. There have been hundreds of car startups over the years that got that far.[515]

这正是特斯拉达成的独特且重要的成就。难点不在于设计电动汽车、制造电动汽车原型，甚至不在于小批量生产汽车。真正的挑战不是创造原型或进行限量生产。多年来已有数百家汽车初创企业做到这一步。[515]

The difficult thing—which has not been accomplished by an American car company in one hundred years—is reaching volume production without going bankrupt. That is the actual hard thing. The last American car company to reach volume production without going bankrupt was Chrysler. That was in the 1920s.[516]

真正的难题——也是过去一百年来美国汽车公司未能实现的——是在不破产的前提下达成量产。这才是真正的艰难之处。上一家在不破产情况下实现量产的美国汽车公司是克莱斯勒，那还是在1920年代。[516]

更多资源 https://mirrorsite.org

KEEPING TESLA ALIVE

让特斯拉存活

> Tesla is alive by the skin of its teeth. So is SpaceX. If things had gone a little bit the other way, both companies would be dead.
>
> 特斯拉当时命悬一线，太空探索技术公司亦是如此。若当时稍有差池，两家公司都将不复存在。

Man, this was grim. I thought this was going to turn into a tale of warning for hubris.[517]

老天，这局面真是惨烈。我还以为这会演变成一个关于傲慢自大的警世故事。[517]

In 2008, SolarCity made a deal with Morgan Stanley, and Morgan Stanley had to renege on the deal because they themselves were running out of money. For a while it looked like all three companies were going to die. I was also going through a divorce. In addition to all that, I was getting dumped on, massively, in the press. That was definitely a low point.[518]

2008年，太阳城公司与摩根士丹利达成协议，但摩根士丹利因自身资金枯竭不得不违背协议。曾有一段时间，这三家公司似乎都濒临倒闭，而我也正经历离婚。除此之外，我还遭受着媒体铺天盖地的抨击。那无疑是我人生的低谷时期。[518]

In the midst of this, I faced one of the most difficult choices of my whole life. Tesla and SpaceX were both on the brink of bankruptcy.

更多资源 https://mirrorsite.org

在此困境中，我面临着人生中最艰难的抉择之一。特斯拉与太空探索技术公司同时濒临破产状态。

I had maybe $30 million or $40 million left. I had two choices: I could put it all into one company, and the other would definitely die. I could split it between Tesla and SpaceX—but if I split it between the two, they both might die.

我仅剩约3000万至4000万美元的资金。我面临两个选择：将资金全数投入其中一家公司，另一家必将倒闭；或在两家公司间均分资金——但若均分，两家都可能倒闭。

When you put your blood, sweat, and tears into creating something, building something important—it's like a child.

当你倾注血汗泪水创造重要事物时，它就如同自己的孩子。

Which one will I let starve to death?

我该任哪一个孩子饿死？

I couldn't bring myself to do it.

我实在无法让自己这么做。

So, I split the money between the two.[519]

所以我把钱分给了两家公司。[519]

更多资源 https://mirrorsite.org

Trying to raise money for a startup electric car company in 2008 while GM was going bankrupt was difficult, to say the least. Eventually a subset of the previous investors came in, which included Antonio Gracias, Steve Jurvetson, and Aaron Price, all whom I hold a debt of gratitude to. They said they would invest as much as I put in, so I put in everything. All the money I had left. Literally everything. I didn't have a house. I was staying in Jeff Skoll's spare bedroom.

2008年通用汽车濒临破产之际，为一家电动汽车初创企业筹集资金，毫不夸张地说简直难如登天。最终部分原有投资人决定注资，包括安东尼奥·格拉西亚斯、史蒂夫·尤尔韦特松和亚伦·普莱斯，我对他们永怀感激。他们承诺将匹配我的个人投资额度，于是我倾囊而出。我剩余的所有资金。字面意义上的全部家当。当时我连房产都没有。我借住在杰夫·斯科尔的客房。

(Note from Eric: At this point, Steve Jurvetson might interject with this context about entrepreneurial heroism.

（埃里克注：此时史蒂夫·尤尔韦特松可能会补充这段企业家精神的注解）

"Elon wrote a check for the entire remainder of his personal wealth to save the company, covering payroll during Christmas when no one else would. The economy was in a bad situation. Goldman just failed a private offering. It was the middle of the financial crisis.

"埃隆动用了个人财富的全部余款拯救公司，在圣诞期间无人援手时独自承担了薪资支出。当时经济形势岌岌可危。高盛的私募发行刚刚宣告失败。当时正值金融危机中期。

Tesla did not look appealing, either. There was no DOE loan. There was no Daimler deal. The car had a negative gross margin. Oh, and the largest shareholder was pissed off, going AWOL. It was ugly.")[520]

特斯拉的处境同样不妙。没有能源部贷款。没有戴姆勒的合作协议。汽车毛利率为负值。更糟的是，最大股东愤然失联。局面极其难看。

更多资源 https://mirrorsite.org

520

We closed that round at 6:00 p.m. on Christmas Eve 2008. It was the last hour of the last day possible. We would have bounced payroll two days after Christmas.

我们在2008年圣诞夜下午6点完成了那轮融资。这是最后一天的最后时刻。否则圣诞节后两天我们就发不出工资了。

Eventually, Daimler executives came to visit. They showed up expecting a PowerPoint. While they were on their way over, we dropped a Roadster motor and battery into a Smart Car and let them drive it. They were shocked when it hit 60 mph in four seconds. Daimler ended up investing $50 million. If Daimler had not invested in Tesla at that time, we would have died.[521]

最终戴姆勒高管前来考察。他们原以为要看PPT演示。途中我们给一辆Smart Car装上了敞篷跑车的电机电池。试驾时车辆四秒加速到60英里，令他们震惊不已。戴姆勒最终投资了五千万美元。若当时戴姆勒没有注资特斯拉，我们早已倒闭。[521]

It’s definitely stressful when death is inches from your face, trying to eat your face off—like *right there* and the foam is spattering on you.[522]

当死亡近在咫尺试图吞噬你——仿佛就在眼前，唾沫星子喷溅到你身上时，压力确实巨大。[522]

For a while all I could think was, “We need to live. How do we live?”[523]

有段时间我满脑子都在想：“我们必须活下去。该怎么活下去？”[523]

> At both SpaceX and Tesla in 2008, if we’d paid our suppliers on time we would have gone bankrupt immediately.[524]

更多资源 https://mirrorsite.org

2008年，无论是太空探索技术公司还是特斯拉，若当时按时支付供应商款项，公司就会立即破产。[524]

更多资源 https://mirrorsite.org

THE EDGE OF SANITY

理智的边缘

Q: How do you prioritize with so many things going on at once?

问：面对如此多并行推进的事务，您如何确定优先级？

Prioritizing has usually been out of desperation, not selection. It's not, "Oh, let's sit back and leisurely decide how we shall spend these resources." It's, "This isn't working, if we don't make it work, we're gonna go bankrupt, so we better make it work."

优先级排序往往源于别无选择，而非主动选择。这并非'让我们从容决定资源分配'，而是'此路不通，若不解决就会破产，我们必须攻克难关'

We messed up almost every aspect of the Model 3 production line. There were so many mistakes, the entire company had to be devoted to fixing them. We took everyone off every other project—we all started working on the Model 3. We had to make it work or there wouldn't be any more Tesla.[525]

Model 3生产线的每个环节几乎都出了问题错误堆积如山，整个公司不得不全力纠错我们暂停所有其他项目，全员投入Model 3攻坚我们必须成功，否则特斯拉将不复存在[525]

There was no choice. We had to get to high-volume production. It was a chicken-and-egg situation. You can't make the car at an affordable price unless you have high volume. Without high volume, you can't sell at an affordable price. So what do you do?[526]

别无选择。我们必须实现高产量生产。这是个鸡生蛋蛋生鸡的困局。除非实现大规模生产，否则无法以可承受的价格制造汽车。没有高产量，就无法以可承受的价格销售。该怎么办？[526]

> You take a giant flying leap at high volume and hope you can grab a cliff ledge with your fingertips.[527]
>
> 只能全力冲刺高产量目标，指望能在悬崖边缘抓住最后生机。[527]

I felt like Indiana Jones running through the temple. There's a huge boulder chasing you and you need to jump across a giant pit in the ground. If you slow down, the boulder will crush you, and if you don't make the leap, you'll die in the pit. That's prioritizing.[528]

我感觉自己就像在神庙中狂奔的印第安纳琼斯。身后巨石紧追不舍，面前是必须跨越的深渊巨壑。若减速会被巨石碾压，若失足会坠入深渊——这就是优先级管理。[528]

Q: How did you motivate the team to do whatever it takes?

问：你如何激励团队不惜一切代价达成目标？

> I told them we had to go ultrahardcore. They had to prepare for a level of intensity greater than anything they had experienced before.[529]
>
> 我告诉他们必须进入极限硬核模式。他们需要为前所未有的高强度状态做好准备。[529]

更多资源 https://mirrorsite.org

I lived in the Fremont and Nevada factories for three years fixing that production line, running around like a maniac through every part of that factory, living with the team. I slept on the floor so the team going through a hard time could see me on the floor and know I was not in some ivory tower. Whatever pain they experienced, I had more.[530]

我在弗里蒙特和内华达州的工厂驻扎三年，修复生产线，如疯似狂地跑遍每个车间，与团队共同生活。我睡在地板上，让经历艰难时期的团队亲眼目睹——他们的领导者并未置身象牙塔。他们承受的任何痛苦，我都加倍承受。[530]

I worked to the edge of sanity. There wasn't any other way to make it work but three years of hell. From 2017 to 2019, I experienced the longest period of excruciating pain in my life. There wasn't any other way, and we still barely made it. We were on the ragged edge of bankruptcy the entire time. Three years of pain, but it had to be done or Tesla would be dead.[531]

我工作到神志濒临崩溃的极限。除了历经三年地狱般的煎熬，别无他法让项目运转。2017至2019年，我经历了人生中最漫长的痛苦煎熬期。当时别无选择，我们勉强挺过。整个过程中特斯拉始终处于破产边缘。虽经三年磨难，但此举势在必行，否则特斯拉早已不复存在。[531]

At this point, I think I know more about manufacturing than anyone currently alive on Earth.

此时此刻，我认为自己对制造业的认知已超越地球上任何在世之人。

I can tell you how every damn part in that car is made. That's what happens when you live in the factory for three years.[532]

我能告诉你那辆车里每个部件的具体制造工艺。在工厂里生活三年就会获得这样的能力。[532]

更多资源 https://mirrorsite.org

A WHOLE NEW KIND OF CAR COMPANY

全新形态的汽车企业

> Ultimately, what we induce other companies to do will have a greater impact than the cars we make ourselves.[533]
>
> 最终而言，我们推动其他企业采取的行动，将比我们自产汽车产生更大的影响力。[533]

Q: A Tesla is a very different product, but how different is Tesla as a company from a traditional auto company?

问：特斯拉产品极具颠覆性，但作为企业，特斯拉与传统汽车公司的核心差异究竟何在？

A typical car company manages a supply chain, assembles vehicles, and sends them to dealers. They might make the engine, but most of the actual technology development and parts manufacturing is done by suppliers. Most of the vehicle software is done by suppliers too. The amount of “real work” done by car companies like GM or Ford is not as much as you think. They don’t do sales or service either; dealerships do.[534]

传统车企管理供应链、组装车辆，再交付经销商网络。它们可能制造发动机，但实际技术开发与部件制造主要依赖供应商完成。车辆软件也大多由供应商提供。通用汽车或福特等车企承担的'实质工作'远少于人们想象。它们既不负责销售也不提供售后，这些职能均由经销商承担。[534]

更多资源 https://mirrorsite.org

At Tesla, we do our own sales and service. We don’t have dealerships.[535] I have made it a principle within Tesla that we should never attempt to make service a profit center. It does not seem right to me when companies make a profit off customers when their product breaks.[536] The best way to experience service is, of course, to not need service.[537]

At Tesla, we do our own sales and service. We don’t have dealerships. | 在特斯拉，我们自主完成销售与售后服务体系建设。我们不设经销商体系。[535] I have made it a principle within Tesla that we should never attempt to make service a profit center. It does not seem right to me when companies make a profit off customers when their product breaks. | 我在特斯拉确立的核心原则是：服务部门绝不应当成为盈利中心。当产品出现故障时企业还能从客户身上获利，这在我看来并不合理。[536] 体验服务的最佳方式，当然是根本不需要售后服务。[537]

> If we charge for something, it is not because we want to make things more expensive; it’s because we can’t figure out how to make it less expensive.[538]
>
> 如果我们对某项服务收费，绝非意图抬高价格；而是因为我们尚未找到降低其成本的方法。[538]

There’s a lot of vertical integration at Tesla. We make the battery pack, the power electronics, and the drivetrain ourselves. We’re vertically integrated because the pace we needed to move was much faster than the supply chain could move. To the degree you rely on the legacy supply chain, you inherit the legacy constraints—including their speed, costs, and technology.

特斯拉实现了高度垂直整合：我们自主生产电池组、电力电子系统和传动系统。选择垂直整合，是因为我们必须超越传统供应链的响应速度。依赖传统供应链的程度越深，继承的制约就越多——包括其响应速度、成本结构和技术局限。

更多资源 https://mirrorsite.org

We do car insurance now, too. Car insurance is a bigger deal than it may seem. A lot of people are paying 30–40 percent as much as their car lease payment for insurance. The car insurance industry is incredibly inefficient because they've got all these middlemen, from the insurance agent all the way to the final reinsurer. There are a half dozen companies each taking a cut.[539]

我们现已开展车险业务。汽车保险的重要性远超表面所见。许多人支付的保险费高达车辆月租金的30%至40%。 汽车保险行业效率极其低下，因为存在众多中间环节——从保险代理人到最终再保险公司层层加码。五六家公司层层分一杯羹。[539]

Insurance is driven by statistics, so even if you're a good driver at twenty years old, it's extremely expensive. Tesla allows for real-time insurance based on how you actually drive the car. If you drive the car in a safer way, you pay lower insurance. Our insurance is based on how you drive, not how people who fit your demographic have driven historically.[540]

保险定价基于统计模型，因此即便你是二十岁的优秀驾驶员，保费仍极其高昂。特斯拉提供基于实际驾驶行为的实时保险。驾驶方式越安全，保费越低。我们的保险基于您的实时驾驶行为，而非传统按人群历史数据定价的模式。[540]

Tesla is as much a software company as a hardware company. The software in a Tesla operates the car, the screen, the charging…all developed by us. Then, Tesla built an autopilot AI team from scratch, the best real-world AI team on Earth. We also built a chip team too, because the hardware we could buy wasn't capable of running our AI software.[541]

特斯拉既是硬件公司，更是软件公司。特斯拉车辆的软件系统——包括整车控制、中控屏、充电管理等——均由我们自主开发。我们更从零打造了地球上最顶尖的现实世界自动驾驶人工智能团队，并专门组建芯片团队，因为市面硬件无法满足我们人工智能软件的运行需求。[541]

更多资源 https://mirrorsite.org

Q: How important is the look and design of the cars?

问：汽车的外观设计有多重要？

> The value of beauty and inspiration is underrated, no question.[542]
>
> 美感与启发性的价值的确被低估了。[542]

If you want to make something beautiful, you must trigger whatever fundamental aesthetic algorithms there are. Our brains have some intrinsic elements that represent beauty, which trigger the emotion of appreciation of beauty in our mind.

若要创造美物，必须触发所有潜在的美学算法。人脑存在表征美感的先天元素，能激发我们内心的审美情感。

I think these are relatively consistent among people. Not completely. Not everyone likes exactly the same thing, but there's a lot of commonality. It is important to combine aesthetic design with functionality.

我认为这些元素在人群中的一致性相对较高，但并非绝对。并非人人喜好完全相同，但存在广泛共性。将美学设计与功能性结合至关重要。

What was hard about the Model S and Model X was to combine aesthetics and utility, to balance the two. You can make a car look good by giving it certain proportions—making it low and slim. But if you do that, the utility is significantly affected. The big challenge is trying to figure out how to get five adults plus two kids in a seven-seater with high utility *and* keep it looking good. To make a sports car look good is relatively easy. But to make a sedan or an SUV look good is quite difficult.[543]

更多资源 https://mirrorsite.org

型号S与型号X的难点在于平衡美学与实用性。通过特定比例设计——如压低车身、塑造流线型——可使汽车外观出众。但如此设计会严重影响实用功能。核心挑战在于：如何在保持高实用性的前提下，使七座车型容纳五名成人加两名儿童同时保持美观造型。要让跑车外观出众相对容易。但要使轿车或SUV造型美观则相当困难。[543]

Another incredibly important design principle is to have it feel bigger on the inside than it looks on the outside. That's also a hard thing to do.[544]

另一项至关重要的设计原则是：内部空间感需大于外部视觉尺寸。这同样难以实现。[544]

Most people don't consciously notice the small details, but they do subconsciously. Your mind takes in an overall impression. You know if something is appealing or not, even though you may not be able to point out exactly why. That sense is a summation of many details. Most of us experience this as "that's ugly," or "that's beautiful," or "wow, that's elegant," but can't break down why.[545]

多数人不会刻意关注微小细节，但潜意识会感知它们。大脑会形成整体印象。即使无法明确指出原因，你也能感知事物的吸引力。这种直觉是诸多细节的综合体现。我们大多会直觉反应"真丑"或"真美"，抑或惊叹"如此优雅"，却难以解析具体成因。[545]

You can train yourself. You can make yourself pay attention to "why." You can learn to bring subconscious awareness into conscious awareness. Look closely and carefully. Look at each object's geometry.[546]

这种能力可以培养。你可以训练自己探究"为什么"的能力，学会将潜意识感知转化为有意识认知。仔细观察。审视每件物品的几何构造。[546]

Pay attention to the little details. Train yourself to notice them. Notice the nuances of design, shape, form, function, and the way it looks in different lights. Anyone can do this, although it is a double-edged sword, because

更多资源 https://mirrorsite.org

then you always notice all the little things. Now when something’s off—even a little thing—it drives me bananas.

关注那些精微细节。训练自己捕捉这些细节。留意设计中的细微差别：形状、形态、功能，以及在不同光线下的呈现效果。人人都能做到这点，尽管这是把双刃剑——从此你总会注意到所有细节。如今若有丝毫偏差——即便是微小细节——都会让我抓狂。

If you’re trying to make a perfect product, attention to detail is essential.[547]

若要打造完美产品，细节关注至关重要。[547]

更多资源 https://mirrorsite.org

GIVE PEOPLE MORE FOR LESS

以更低成本提供更多价值

> Revolutionizing industries is not for the faint of heart.[548]
>
> 颠覆行业非意志薄弱者所能为。[548]

Q: How do you think about iterating through products to reach a mass market?

问：如何通过产品迭代打入大众市场？

The nature of new technology adoption tends to follow an S-curve. People underpredict it in the beginning, because they tend to extrapolate trends in a straight line. Then they'll overpredict it at the midpoint during massive growth. It will take longer than people think at the midpoint, but much shorter than people think at the beginning.[549]

新技术普及的本质往往遵循S型曲线规律。初期人们总会低估发展速度，因其惯于线性外推趋势。而在中期爆发式增长阶段，又会过度高估其潜力。项目实际耗时在中期会比预期更长，但在初期却会大大缩短预期时间。[549]

One way to look at technology is like rendering an image in successive levels of detail. The first layer of the image is very blurry and things are out of place. Then with the next pass, it gets a bit more defined and things start to shift into place. And you do another pass and another pass, and eventually it's refined and actually works.[550] It generally takes three major iterations of any major new technology to have it work really, really well.[551]

更多资源 https://mirrorsite.org

One way to look at technology is like rendering an image in successive levels of detail. The first layer of the image is very blurry and things are out of place. Then with the next pass, it gets a bit more defined and things start to shift into place. And you do another pass and another pass, and eventually it's refined and actually works. | 理解技术的过程，如同对图像进行逐级细化的渲染。初始渲染层极为模糊，各元素位置错乱。次轮渲染后轮廓渐显，元素开始归位。经过层层迭代优化，最终实现精密运作。[550] 任何重大新技术通常需经三轮核心迭代，方能臻至卓越境界。[551]

Progress comes from design and technology improvements as well as scale. Look at the earliest cell phones. In the original *Wall Street* movie in 1987, the guy's walking down the beach with a giant phone, carrying a briefcase to power it. It had like thirty minutes of battery life. Without technology improvements, no amount of money or scale could have made that phone affordable. It took a lot of engineering and design iterations.[552]

进步源自设计革新、技术升级与规模效应。早期移动电话即是明证。1987年原版《华尔街》电影中，主角携带公文箱大小的供电设备，在海滩使用巨型电话，电池续航仅约三十分钟。若无技术突破，纵有海量资金与规模效应，亦难实现该型电话的普及化。这需要大量的工程学与设计迭代。[552]

In the early days of cell phones, laptops, and gasoline cars, they were considered toys for rich people. You need to go through this phase of having an expensive car available to few in order to build the low-cost car available to many. The first version is simply about making the new technology work. Then, you work to optimize.[553]

在手机、笔记本电脑和汽油车的早期阶段，它们被视为富人玩具。你必须经历这个阶段：先制造面向少数人的昂贵汽车，才能最终打造面向大众的低成本汽车。第一代版本的核心任务是让新技术得以运行。随后才着手进行优化。[553]

更多资源 https://mirrorsite.org

We’re probably on the thirtieth version of a cell phone, and with each successive design iteration we add more capability. We integrate more parts and figure out better ways to produce it so it gets both better and cheaper. Progress in any new technology takes multiple versions and a large production volume to make it affordable.[554]

手机可能已演进至第三十代，每代设计迭代都增强其功能。我们整合更多部件，探索更优生产方式，从而实现性能提升与成本降低的双重目标。任何新技术的普及都需要多代产品演进与大规模量产才能实现成本可控。[554]

Air travel used to be accessible to only a few people. It was insanely expensive and dangerous. Now it is common to fly. The first TVs were rare and expensive. Then big, flat-screen plasma TVs used to be extremely expensive. Now, you can buy an amazing flat-screen plasma for two hundred bucks. It’s amazing.[555]

航空旅行曾经仅是少数人的特权。当时不仅价格惊人，安全风险也极高。如今飞行已稀松平常。初代电视机同样稀有且昂贵。当时大型平板等离子电视曾极其昂贵。如今仅需两百美元就能买到惊艳的平板等离子电视，这令人惊叹。[555]

This is also true for electric cars. The strategy for Tesla was to enter at the high end of the market with the Roadster, where customers are prepared to pay a premium. Then move as fast as possible to higher volume and lower prices with each successive model.[556]

电动汽车领域同样如此。特斯拉的战略是以敞篷跑车型号切入高端市场，该市场的消费者愿意支付溢价。随后通过后续型号快速实现更大规模量产与更低价格。[556]

The Model S was a sporty four-door family car at roughly half the price point of the Roadster. Then the Model 3 was even more affordable. All free cash flow was plowed back into R&D to drive down costs and bring the next products to market as fast as possible. When someone bought the Tesla

更多资源 https://mirrorsite.org

Roadster, they were helping pay for development of the low-cost family car.[557]

S型号是售价约为敞篷跑车一半的运动型四门家庭轿车，而3型号则更具性价比。所有自由现金流均投入研发，以降低成本并加速推出后续产品。当有人购买特斯拉Roadster时，他们实际上在资助低成本家用车的研发。[557]

Q: Any other unique aspects about Tesla's product philosophy?

问：特斯拉的产品理念还有其他独特之处吗？

Focus on signal over noise. A lot of companies get confused. They spend a lot of money on things that don't actually make the product better. At Tesla, we put all the money into research and development, manufacturing, and design to try and make the cars as good as possible. For any company, ask, "Are the efforts we're expending resulting in a better product or service?" If they're not, stop those efforts.[558]

聚焦信号而非噪音。许多公司迷失了方向。它们将大量资金投入无法真正改善产品的地方。在特斯拉，我们将所有资金投入研发、制造和设计，竭尽全力打造更卓越的汽车。任何公司都应自问：'我们的投入是否带来了更好的产品或服务？'若非如此，立即停止这些投入。[558]

Also, go for extreme levels of precision. One of the examples we use at Tesla is LEGO blocks. LEGO is super precise. The press-fit comes down to a quarter millimeter or less, and each one is exactly the same. LEGO doesn't work if the press-fit is too soft or too hard. If it's too soft, the press-and-click won't stick; if it's too hard, you can't get it on. They can make something that is a tiny fraction of a millimeter accurate and it's a low-cost plastic toy. If LEGO can be that precise, so can a car.[559]

同时追求极致精度。我们在特斯拉使用乐高积块作为范例——其精度堪称典范。压配精度可达四分之一毫米以内，且每块积木完全一致。若按压契合度过松或过紧，乐高便无法正常运作。过松则按压点击无

更多资源 https://mirrorsite.org

法牢固粘合；过紧则难以组装。他们能以毫米级精度制造低成本塑料玩具。若乐高可达到此等精密程度，汽车制造同样可行。[559]

更多资源 https://mirrorsite.org

THE BATTLE OF PUBLIC PERCEPTION

公众认知之战

> It should puzzle you that a Tesla crash resulting in a broken ankle is front-page news, yet the many thousands of people who die in US auto accidents each year get almost no coverage.[560]
>
> 特斯拉事故致脚踝骨折竟登上头版，而美国每年数万车祸死亡事件却鲜见报道，此等现象着实令人费解。[560]

Q: How do you stay positive when faced with public attacks and misrepresentation, without becoming resentful or cynical?[561]

问：面对公众攻击和曲解时，如何保持积极心态而不滋生怨恨或愤世嫉俗？[561]

It does get me down at times. It makes me sad. But at some point you realize these attacks are by people who don’t know you and their goal is to generate clicks. If you can detach yourself emotionally (which is not easy) and say, “This person does not know me. They’re just writing to get clicks” then it doesn’t hurt as much.[562]

这些确实会让我情绪低落，感到悲伤。但最终你会明白，这些攻击出自不了解你的人之手，他们的目标仅仅是博取点击率。若能情感抽离（这并不容易），告诉自己'此人并不了解我，他们写作只为博取点击'，那么伤害就会减轻。[562]

更多资源 https://mirrorsite.org

It also helps to stay focused on our mission. Tesla's motivation remains to make electric transport as affordable as possible. That informs all our actions.[563]

专注我们的使命目标同样有所助益。特斯拉的初衷始终是让电动交通尽可能普及化。这指引着我们所有行动。[563]

We put all our money and effort into trying to make the product as compelling as possible. The way to sell any product is through word of mouth. The key is to have a product people love. People will talk about the things they love.[564]

我们倾注全部资金和精力，力求使产品具备极致竞争力。任何产品的销售之道都在于口碑效应。关键在于打造人们热爱的产品。人们总会谈论自己喜爱的事物。[564]

That generates real word of mouth, and that's how our sales have grown. We're not spending money on advertising, public relations, or endorsements. Anyone who buys our car bought it because they like the car, not their impression of the car.[565]

由此产生真实的口碑传播，这正是我们销售增长的驱动力。我们不投入资金进行广告宣传、公共关系或品牌代言。客户购买我们的汽车纯粹源于产品本身吸引力，而非品牌印象。[565]

Tesla does not advertise or pay for endorsements. Instead, we use that money to make the product great.[566]

特斯拉既不投放广告也不支付代言费用。我们将这些资金全部用于提升产品品质。[566]

更多资源 https://mirrorsite.org

There are over a million internal combustion engine car fires per year resulting in thousands of deaths, but one Tesla car fire with no injuries gets the biggest headlines. Why the double standard?[567]

全球每年发生超百万起内燃机汽车火灾，导致数千人死亡，但一起无人受伤的特斯拉火灾却成为头条焦点。为何存在双重标准？[567]

The problem is journalists are under constant pressure to get maximum clicks. They either earn advertising dollars or get fired. It's a tricky situation, since Tesla doesn't advertise and fossil fuel companies and legacy car companies are among the world's biggest advertisers.[568]

核心问题在于媒体持续承受着流量压力。记者们要么赚取广告收益，要么面临失业风险。这形成微妙局面：特斯拉不投广告，而化石燃料企业和传统汽车制造商恰是全球最大广告主。[568]

Regulators tend to pay a disproportionate amount of attention to whatever is in the press. This is an objective fact. And Tesla generates a lot of press. In the United States, there are about forty thousand automotive deaths per year. But if there are four in a Tesla, they'll probably receive a thousand times more press than any other incident.[569]

监管机构往往对媒体报道内容给予过度关注。这是个客观事实。而特斯拉始终占据大量媒体报道。美国每年约有四万人死于交通事故。但若特斯拉事故造成四人死亡，其媒体曝光度可能达到普通事故的千倍以上。[569]

The reality is a Tesla, like most electric cars, is over 500 percent *less* likely to catch fire than gas combustion engine cars, which carry massive amounts of highly flammable fuel. Why is this never mentioned?[570]

实际情况是，特斯拉与大多数电动汽车一样，火灾概率比携带大量高度易燃燃料的汽油内燃机汽车低*500%*以上。 为何这一点从未被提及？[570]

更多资源 https://mirrorsite.org

FOUNDING SOLARCITY

创立太阳城公司

Q: How did SolarCity fit into the vision for Tesla?

问：太阳城公司如何融入特斯拉的愿景？

The earth is almost entirely solar powered today. The only reason we're not a frozen ice ball at three degrees Kelvin is the sun. The sun is responsible for precipitation. It's responsible for the vast majority of the ecosystem. We could say the entire earth is solar powered. That may not be super obvious to people. Also, the energy we consume to power civilization today is actually a tiny amount of the total energy the sun sends in our direction.[571]

如今地球几乎完全依赖太阳能驱动。地球没有变成3开尔文的冰冻星球，唯一原因就是太阳。太阳主导着降水系统，支撑着绝大部分生态系统。可以说整个地球都依靠太阳能运转。这点或许并非人人皆知。而且，当前驱动人类文明的能源消耗，其实只占太阳投射到地球总能量的极小部分。[571]

I wouldn't say there was a particular epiphany to start SolarCity. I was at Burning Man with my cousins. They were thinking about what company to start after their first startup, called Everdream, sold to Dell. They built software that enabled companies to manage tens of thousands of computers.[572]

创立太阳城公司并非源于特定顿悟。当时我与表亲们正在火人节现场。他们当时正在思考首个初创企业Everdream出售给戴尔后该创办什么公司。其开发的软件可帮助企业高效管理数万台电脑设备。[572]

I was trying to convince them to do solar, because I thought it was an area that needed really good entrepreneurs. I was already somewhat

更多资源 https://mirrorsite.org

overcommitted at the time. I said, “If you guys do a solar company, I’ll fund you and give whatever guidance I can provide.”[573]

我极力说服他们进军太阳能领域，因为该行业迫切需要优秀企业家。当时我的工作日程已呈超负荷状态。我承诺道：“如果你们创立太阳能公司，我将提供资金支持并倾囊相授所有经验。”[573]

I thought it was really important for great entrepreneurs to build in solar because it wasn’t doing well as an industry. People were not focusing on the right problem. The industry acted like the solar panel production was the main problem. It’s *a* problem, but it’s not the most important problem. The panel is somewhat commoditized at this point. Making standard-efficiency solar panels is about as hard as making drywall. It’s easy. In fact, making drywall is probably harder.[574]

我认为顶尖企业家投身太阳能领域至关重要，当时该行业整体发展态势疲软。行业人士未能聚焦真正关键的问题。整个行业表现得仿佛太阳能板生产才是核心难题。这是个问题，但绝非最关键所在。当前太阳能板已呈现明显商品化特征。制造标准-效率的太阳能板，其难度与生产石膏板相当——实属简易。实际上，生产石膏板可能反而更困难。[574]

The thorny problem is figuring out how to get solar on tens of thousands, eventually hundreds of thousands, of rooftops. You’ve got to reroof millions of buildings, figure out how the grid interconnects work, and then manage all those systems.

核心难题在于如何为数万乃至最终数百万屋顶部署太阳能系统。需要翻新数百万建筑的屋顶，解决电网互联技术问题，并统筹管理所有系统。

With hundreds of thousands of distributed systems, managing them all is tough. It is a really complex distributed energy company. This played to their strengths: creating scalable software for managing computers in a distributed fashion.

更多资源 https://mirrorsite.org

管理数十万套分布式系统极具挑战性。这确实是一家高度复杂的分布式能源企业。这正契合他们的核心优势：开发可扩展的分布式计算机管理软件。

The SolarCity team did an awesome job. I would show up to the board meetings asking, “What’s the good news this time?” They did an amazing job with almost no help from me.[575]

太阳城团队成就非凡。每次董事会会议上我都会询问：'这次有什么突破？'他们几乎在没有我协助的情况下就取得了惊人成果。[575]

We want to create a well-integrated beautiful solar-roof-with-battery product. This empowers individuals to be their own utility, then scale that throughout the world. One ordering experience, one installation, one service contact, one phone app.

我们的目标是打造无缝集成的太阳能-屋顶-与-电池一体化完美产品。这使个人能够成为自己的实用工具，进而在全球范围内扩大规模。一次订购体验、一次安装服务、一个客服联系点、一款手机应用。

We can’t do this well if Tesla and SolarCity are different companies. We needed to break down the barriers of being separate companies. That they were separate at all is largely an accident of history. They have similar origins and pursue the same overarching goal of sustainable energy. When Tesla was ready to scale Powerwall (our home battery for energy storage) and SolarCity was ready to provide a differentiated solar system for energy generation, the time had come to bring them together.[576]

若特斯拉与太阳城公司分属不同企业，我们便无法有效实现这一目标。必须打破两家独立公司之间的壁垒。二者曾经分离的状态很大程度上是历史的偶然。二者起源相似，都致力于实现可持续能源这一首要目标。当特斯拉准备扩大Powerwall（家用储能电池）规模，太阳城公司也准备好提供差异化太阳能系统时，整合时机已然成熟。[576]

464 “Future of Energy & Transport,” Oxford Martin School.

更多资源 https://mirrorsite.org

464 《能源与交通的未来》，牛津马丁 学院

465 “Conversation avec Elon Musk à Paris 1 Panthéon-Sorbonne,” Université Paris 1 Panthéon-Sorbonne, December 3, 2015, YouTube video, 1:03:45, https://www.youtube.com/watch?v=BMskI6G9ty0.

465 “巴黎第一大学与埃隆·马斯克的对话”，巴黎第一大学，2015年12月3日，YouTube视频，1:03:45，https://www.youtube.com/watch?v=BMskI6G9ty0。

466 Elon Musk, “The Secret Tesla Motors Master Plan (Just Between You and Me),” *Tesla Blog*, August 2, 2006, https://www.tesla.com/secret-master-plan.

466 埃隆·马斯克，“特斯拉秘密宏图（ 仅你知我知）”， 特斯拉博客， 2006年8月2日，https://www.tesla.com/secret-master-plan。

467 Musk (@elonmusk), X account.

467 马斯克 (@elonmusk)，X 账号

468 Musk, “Master Plan, Part Deux.”

468 马斯克， 《总体规划：部件 二》

469 “Elon Musk, CEO of Tesla at ONS 2014.”

469 《特斯拉CEO埃隆·马斯克于ONS 2014》

470 “Elon Musk, CEO of Tesla at ONS 2014.”

470 “特斯拉首席执行官埃隆·马斯克在ONS 2014。”

471 “Future of Energy & Transport,” Oxford Martin School.

471 “能源与交通的未来”，牛津马丁 学院。

472 “Future of Energy & Transport,” Oxford Martin School.

472 “能源与交通的未来”，牛津马丁 学院。

473 “Future of Energy & Transport,” Oxford Martin School.

473 《能源与交通的未来》，牛津马丁 学院

474 Hoffman, “Elon Musk, the Rocket Man.”

474 霍夫曼， 《埃隆·马斯克：火箭 人》

475 Musk (@elonmusk), X account.

475 马斯克 (@elonmusk)，X 账号

更多资源 https://mirrorsite.org

476 Musk (@elonmusk), X account.

476 马斯克 (@elonmusk)，X 账号。

477 Anderson and Musk, “A Future Worth Getting Excited About.”

477 安德森与马斯克，《令人期待的未来》。

478 Anderson and Musk, “A Future Worth Getting Excited About.”

478 安德森与马斯克，《令人期待的未来》。

479 Anderson and Musk, “A Future Worth Getting Excited About.”

479 安德森与马斯克，《一个值得期待的激动 人心的未来》

480 Musk, “Master Plan, Part Deux.”

480 马斯克，《总体规划，第二 部》

481 “Elon Musk, Charlie Rose Interview (2009).”

481 《埃隆·马斯克接受查理·罗斯采访（2009年）》

482 “Pando Monthly Fireside Chat.”

482 “潘多月度炉边谈话 。”

483 “Third Row Tesla Podcast, Episode 7.”

483 “特斯拉第三排播客，第7 章节。”

484 “Pando Monthly Fireside Chat.”

484 “潘多月度炉边谈话 。”

485 “Pando Monthly Fireside Chat.”

485 “Pando Monthly 炉边谈话 ”

486 “Pando Monthly Fireside Chat.”

486 “Pando Monthly 炉边谈话 ”

487 “Pando Monthly Fireside Chat.”

487 “Pando Monthly 炉边谈话 ”

488 “Pando Monthly Fireside Chat.”

488 《Pando Monthly炉边 谈话》

更多资源 https://mirrorsite.org

489 “Musk, Stanford GSB 2013.”

489 《马斯克：斯坦福商学院 2013》

490 “Third Row Tesla Podcast, Episode 7.”

490 《特斯拉第三排播客第 7期》

491 “Third Row Tesla Podcast, Episode 7.”

491 《特斯拉第三排播客》第 7期

492 “Elon Musk Interview with Billionaire Investment Legend Ron Baron 2015,” Baron Capital, Elon Musk Best Videos, December 4, 2015, YouTube video, 51:05, https://www.youtube.com/watch?v=qsIbGKosY1E.

492 《亿万富翁投资传奇罗恩·巴伦专访埃隆·马斯克（2015）》，巴伦资本，埃隆·马斯克最佳视频，2015 年 12 月 4 日，YouTube 视频，51:05，https://www.youtube.com/watch?v=qsIbGKosY1E

493 “2016 Annual Shareholder Meeting,” Tesla.

493 《2016年度股东大会》，特斯拉

494 Isaacson, *Elon Musk*.

494 沃尔特·艾萨克森，《埃隆 马斯克》。

495 Musk and Altman, “Thinking for the Future.”

495 马斯克与阿尔特曼，《为未来思考》。

496 Musk, “Caltech Commencement Speech.”

496 马斯克，《加州理工学院毕业典礼演讲》。

497 Musk and Altman, “Thinking for the Future.”

497 马斯克与阿尔特曼，《面向未来的思考》

498 Musk, “Caltech Commencement Speech.”

498 马斯克，《加州理工学院毕业典礼演讲》

499 Musk, “Caltech Commencement Speech.”

499 马斯克，《加州理工学院毕业典礼演讲》

500 Isaacson, *Elon Musk*.

500 艾萨克森，埃隆 马斯克。

更多资源 https://mirrorsite.org

501 “CHM Revolutionaries: An Evening with Elon Musk.”

501 《计算机历史博物馆革新者：与埃隆 马斯克共度之夜》

502 Musk, “Caltech Commencement Speech.”

502 马斯克，《加州理工学院毕业 典礼演讲》

503 “Elon Musk on His PayPal Firing,” Inc. 5000.

503 “埃隆·马斯克谈他被PayPal解雇一事”，Inc. 5000。

504 Musk, “Caltech Commencement Speech.”

504 马斯克，“加州理工学院毕业典礼 演讲”。

505 “Talking Tech with Elon Musk!,” Marques Brownlee, August 17, 2018, YouTube video, 17:53, https://www.youtube.com/watch?v=MevKTPN4ozw.

505 “与埃隆·马斯克聊技术！”，Marques Brownlee，2018年8月17日，YouTube视频，17:53，https://www.youtube.com/watch?v=MevKTPN4ozw。

506 “Elon Musk, Charlie Rose Interview (2009).”

506 《埃隆·马斯克接受查理·罗斯专访（2009年）》

507 “Elon Musk, Charlie Rose Interview (2009).”

507 《埃隆·马斯克接受查理·罗斯专访（2009年）》

508 Musk, “Secret Tesla Motors Master Plan.”

508 马斯克《特斯拉汽车公司绝密总体 规划》

509 Musk, “Master Plan, Part Deux.”

509 马斯克《总体规划：第二 篇章》

510 Musk, “Master Plan, Part Deux.”

510 马斯克，《总体规划，第二部》。

511 “Young Elon Musk Documentary (1999).”

511 《青年埃隆·马斯克纪录片（1999年）》。

512 “Young Elon Musk Documentary (1999).”

512 《青年埃隆·马斯克纪录片（1999年）》。

513 Musk, “Master Plan, Part Deux.”

更多资源 https://mirrorsite.org

513 马斯克，《总体规划，第二部》。

514 “Young Elon Musk Documentary (1999).”

514 《青年埃隆·马斯克纪录片 (1999)》

515 “Elon Musk at TED2022.”

515 《埃隆·马斯克在 TED2022大会》

516 “Elon Musk at TED2022.”

516 《埃隆·马斯克在 TED2022大会》

517 “Elon Musk: Digital Superintelligence,” Y Combinator.

517 《埃隆·马斯克：数字超级智能》，Y Combinator

518 “Pando Monthly Fireside Chat.”

518 《Pando Monthly Fireside Chat》

519 “Pando Monthly Fireside Chat.”

519 《Pando Monthly Fireside Chat》

520 “Musk, Stanford GSB 2013.”

520 《马斯克，斯坦福商学院 2013》

521 Isaacson, *Elon Musk*.

521 沃尔特·艾萨克森，《埃隆 马斯克》。

522 Musk, “Caltech Commencement Speech.”

522 马斯克，"加州理工学院毕业典礼演讲"。

523 “Musk, Stanford GSB 2013.”

523 "马斯克2013年斯坦福商学院演讲"。

524 Musk, “Caltech Commencement Speech.”

524 马斯克，《加州理工学院毕业典礼 演讲》

525 “Third Row Tesla Podcast, Episode 7.”

525 《特斯拉第三排播客》第 7期

526 “Third Row Tesla Podcast, Episode 7.”

更多资源 https://mirrorsite.org

526 《特斯拉第三排播客》第 7期

527 “Third Row Tesla Podcast, Episode 7.”

527 “特斯拉第三排播客，第 7章节。”

528 “Third Row Tesla Podcast, Episode 7.”

528 “特斯拉第三排播客，第 7章节。”

529 Isaacson, *Elon Musk.*

529 沃尔特·艾萨克森，埃隆 马斯克。

530 “Elon Musk at TED2022.”

530 “埃隆·马斯克在 TED2022大会上的演讲。”

531 “Elon Musk at TED2022.”

531 “埃隆·马斯克在 TED2022大会上的演讲。”

532 “Elon Musk at TED2022.”

532 “埃隆·马斯克在 TED2022大会上的演讲。”

533 “Musk, Stanford GSB 2013.”

533 “马斯克，斯坦福商学院 2013。”

534 Musk, “Caltech Commencement Speech.”

534 马斯克，“加州理工学院毕业典礼 演讲。”

535 Musk, “Caltech Commencement Speech.”

535 马斯克，“加州理工学院毕业典礼 演讲。”

536 Elon Musk, “Elon Musk Writes Letter to the People of New Jersey,” CleanTechnica, 2013, https://cleantechnica.com/2014/03/15/elon-musk-writes-letter-people-new-jersey/.

536 埃隆·马斯克，《埃隆·马斯克致新泽西州民众的公开信》，CleanTechnica，2013年，https://cleantechnica.com/2014/03/15/elon-musk-writes-letter-people-new-jersey/。

537 “Creating the World’s Best Service and Warranty Program,” *Tesla* (blog), April 26, 2013.

537 《打造全球最佳服务与保修计划》，特斯拉（博客），2013年4月26日。

538 “2016 Annual Shareholder Meeting,” Tesla.

538 “2016年度股东大会，”特斯拉。

更多资源 https://mirrorsite.org

539 Musk, “Caltech Commencement Speech.”

539 马斯克，“加州理工学院毕业典礼 演讲。”

540 Musk, “Caltech Commencement Speech.”

540 马斯克，“加州理工学院毕业典礼 演讲。”

541 Musk, “Caltech Commencement Speech.”

541 马斯克，“加州理工学院毕业典礼 演讲。”

542 “The Future We're Building—and Boring.”

542 “我们正在建造的未来——以及 枯燥。”

543 “Elon Musk's Vision for the Future.”

543 “埃隆·马斯克对未来的 愿景。”

544 Musk (@elonmusk), X account.

544 马斯克 (@elonmusk)，X 账户。

545 “Elon Musk's Vision for the Future.”

545 “埃隆·马斯克的未来愿景。”

546 “Elon Musk's Vision for the Future.”

546 “埃隆·马斯克的未来愿景。”

547 “Elon Musk: 10X Every 6 Months.”

547 “埃隆·马斯克：每6个月实现十倍增长。”

548 Isaacson, *Elon Musk*.

548 沃尔特·艾萨克森, 埃隆 马斯克.

549 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

549 可汗与马斯克, "特斯拉汽车首席执行官兼 太空探索技术公司创始人访谈"

550 Dodd, “First Look Inside SpaceX's Starfactory.”

550 多德, "太空探索技术公司 星际工厂首度揭秘"

551 “Elon Musk Delivers SpaceX Update on Starship, Mars Goals and More at Starbase,” VideoFromSpace, YouTube video, May 29, 2025, https://www.youtube.com/watch?v=0nMfW7T3rx4.

更多资源 https://mirrorsite.org

551 “埃隆·马斯克在星舰基地公布太空探索技术公司星舰进展、火星目标及其他规划”，VideoFromSpace， YouTube 视频， 2025 年 5 月 29 日， https://www.youtube.com/watch?v=0nMfW7T3rx4。

552 “Talking Tech with Elon Musk,” Marques Brownlee.

552 “与埃隆·马斯克畅谈科技”，Marques Brownlee。

553 Battelle and Musk, “Web 2.0 Summit 08.”

553 巴特尔与马斯克，“Web 2.0峰会 08”。

554 “Talking Tech with Elon Musk,” Marques Brownlee.

554 《与埃隆·马斯克聊科技》，马克斯 布朗利

555 Dodd, “Starship-Catching Tower.”

555 多德，《星舰捕捉 塔》

556 Musk, “Secret Tesla Motors Master Plan.”

556 马斯克，《特斯拉汽车公司绝密 总体规划》

557 Musk, “Secret Tesla Motors Master Plan.”

557 马斯克，《特斯拉汽车公司秘密总体规划》

558 “Musk USC Commencement Speech.”

558 《马斯克南加州大学毕业典礼演讲》

559 “Elon Musk Interview,” Munro Live.

559 《埃隆·马斯克访谈》，Munro Live

560 Musk (@elonmusk), X account.

560 马斯克 (@elonmusk)，X 账号。

561 Fridman and Musk, “Lex Fridman Podcast #438.”

561 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》。

562 Fridman and Musk, “Lex Fridman Podcast #438.”

562 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》。

563 “2016 Annual Shareholder Meeting,” Tesla.

563 特斯拉'2016年度股东大会'。

更多资源 https://mirrorsite.org

564 “Talking Tech with Elon Musk,” Marques Brownlee.

564 “与埃隆·马斯克谈科技”，马奎斯·布朗利。

565 “Talking Tech with Elon Musk,” Marques Brownlee.

565 “与埃隆·马斯克谈科技”，马奎斯·布朗利。

566 Musk (@elonmusk), X account.

566 马斯克（@elonmusk），X账户。

567 Musk (@elonmusk), X account.

567 马斯克 (@elonmusk)，X 账号。

568 Musk (@elonmusk), X account.

568 马斯克 (@elonmusk)，X 账号。

569 Lex Fridman and Elon Musk, “Elon Musk: Tesla Autopilot | Lex Fridman Podcast #18,” Lex Fridman, April 12, 2019, YouTube video, 32:44, https://www.youtube.com/watch?v=dEv99vxKjVI.

569 莱克斯·弗里德曼与埃隆·马斯克，《埃隆·马斯克：特斯拉自动驾驶 | 莱克斯·弗里德曼播客 #18》，莱克斯·弗里德曼，2019 年 4 月 12 日，YouTube 视频，32:44，https://www.youtube.com/watch?v=dEv99vxKjVI。

570 Musk (@elonmusk), X account.

570 马斯克 (@elonmusk)，X 账户

571 “CHM Revolutionaries: An Evening with Elon Musk.”

571 《计算机历史博物馆革新者：与埃隆 马斯克共度一晚》

572 “CHM Revolutionaries: An Evening with Elon Musk.”

572 《计算机历史博物馆革新者：与埃隆 马斯克共度一晚》

573 “CHM Revolutionaries: An Evening with Elon Musk.”

573 《计算机历史博物馆革新者：与埃隆·马斯克共度之夜》

574 “CHM Revolutionaries: An Evening with Elon Musk.”

574 《计算机历史博物馆革新者：与埃隆·马斯克共度之夜》

575 “CHM Revolutionaries: An Evening with Elon Musk.”

575 《计算机历史博物馆革新者：与埃隆·马斯克共度之夜》

更多资源 https://mirrorsite.org

576 Musk, “Master Plan, Part Deux.”

576 马斯克，《总体规划，第二篇章》

更多资源 https://mirrorsite.org

BUILDING SPACEX

创建太空探索技术公司

Building mass-market electric cars was inevitable.

打造大众市场电动汽车是必然趋势

It would have happened without me.

即使没有我，它也会发生

But becoming a space-faring civilization is not inevitable.[577]

但成为太空文明却并非必然[577]

更多资源 https://mirrorsite.org

THE ONLY ONE CRAZY ENOUGH FOR SPACE

唯一疯狂到敢于探索太空的人

> I've always been optimistic. If I wasn't optimistic, I wouldn't be attempting all these crazy things. I must be pathologically optimistic, I suppose.[578]
>
> 我一直都是个乐观主义者若非乐观，我绝不会尝试这些疯狂之举我想，我大概是病态般乐观[578]

The origin of SpaceX was trying to figure out why we had not sent anyone to Mars. The obvious next step after Apollo was to send people to Mars.[579]

太空探索技术公司的创立源于探究人类为何未能登陆火星。阿波罗计划之后，显而易见的下一步就是送人类登上火星。[579]

Every year I'd look at the NASA website, and there didn't seem to be a date for it. We were able to go to the moon in 1969. Our last mission to the moon was in 1972. Now here we are *half a century* later and we still have not gone back to the moon. It would be extremely tragic if Apollo was the high-water mark for humanity, if the moon was as far as we got.[580]

每年我都会查阅美国国家航空航天局的网站，却始终未见相关日程。须知1969年我们就已实现登月。我们最后一次登月任务是在1972年。如今整整半个世纪过去，人类仍未重返月球。若阿波罗计划成为人类文明的最高成就，若月球便是人类探索的终点，那将是莫大的悲剧。[580]

更多资源 https://mirrorsite.org

The space shuttle could only take people to low earth orbit. Then the space shuttle retired, and the United States could take no one to orbit. The trend was dwindling down to nothing. Does this mean we've peaked as a civilization?[581]

航天飞机仅能将人类送至近地轨道。航天飞机退役后，美国彻底丧失了将人类送入轨道的能力。太空探索的热潮逐渐消退直至归零。这是否意味着人类文明已臻巅峰？[581]

If you had asked people in 1969 what the world would look like in fifty years, they would have expected a base on the moon and some people visiting Mars. Maybe even a base on Mars. They would expect orbiting space hotels and other awesome stuff.[582]

若在1969年询问人们对五十年后世界的设想，他们会预期月球基地建成，人类已探访火星，甚至可能建立火星基地。他们将期待轨道太空酒店及其他炫酷科技的出现。[582]

If you told them, "Well, we have a device smaller than a deck of cards with access to all the world's information, and you can talk to anyone instantly on planet Earth. But the United States will not be able to send anyone to orbit," they would have called bullshit. "You have all of that, and nothing is happening in space?!" After we sold PayPal in 2001, I was trying to figure out why.[583]

但若告知他们：'如今我们拥有比扑克牌还小的设备，可获取全球信息，能即时与地球上任何人通话。然而美国却无力送任何人进入轨道。'他们定会觉得荒谬绝伦。'坐拥如此技术，竟毫无太空进展？！'2001年出售PayPal后，我始终在探究原因。[583]

The original idea for SpaceX wasn't to create a company. It was to figure out why we hadn't sent people to Mars. I thought maybe we'd lost the will to explore. I thought we had to *create* the will to explore. But that was wrong.

更多资源 https://mirrorsite.org

太空探索技术公司的创立初衷并非组建企业。而是为了解答人类为何尚未登陆火星。我曾以为或许是丧失了探索的意志。我原以为必须创造探索的意愿。但这认知实属谬误。

We have not lost the will to explore; people just did not think there was a way forward. If people don't think there's a way, then they won't continuously bash their head against the wall for progress.[584]

我们从未丧失探索的意志；人们只是认为前路已断。若觉无路可走，便不会持续碰壁以求突破。[584]

> There must be things to inspire us—that make you proud to be a member of humanity.[585]
>
> 世间必有激励人心的事物——那些让你以人类身份自豪的存在。[585]

The Apollo moon landing was an example of that. Only a handful of people went to the moon—and yet actually we all went to the moon. We went with them vicariously. We shared in that adventure. No one would say that was a bad idea—that Apollo wasn't great. We need more of those.[586]

阿波罗计划登月便是典范。虽仅数人踏足月球——实则我们全体同行。我们借由他们感同身受。我们共同经历了这场冒险。无人质疑此举——阿波罗计划的伟大毋庸置疑。我们需要更多这般壮举。[586]

> The United States is a distillation of the human spirit of exploration. It's fundamental to the psyche.
>
> 美国是人类探索精神的凝聚。这深植于民族心理根基。

更多资源 https://mirrorsite.org

Once people realized, “There is a way to do this,” we got a lot of support.[587]

当人们意识到'此路可行'，支持便如潮水般涌来。[587]

更多资源 https://mirrorsite.org

I EXPECTED TO LOSE EVERYTHING

我预期失去一切

> When something is important enough, you do it even if the odds are not in your favor.[588]
>
> 当某事至关重要，纵使胜算渺茫亦当力行。[588]
>
> When I started them, I guessed both SpaceX and Tesla each had a probability of less than 10 percent to succeed.
>
> 我创立太空探索技术公司和特斯拉时，预估这两家公司的成功概率都不到10%。

I don’t look at ideas and ask, “What is the rank-ordered list of best business opportunities from a financial standpoint?” I look for problems that are important to fix for people now *and* for the future to be good.

我不会审视各种创意并追问'从财务角度最优商业机会的排名'，而是专注于寻找对人类当下福祉和未来前景至关重要的待解难题。

If one were to do a risk-adjusted rate of return estimate on opportunities, building rockets and building cars would be pretty close to the bottom of the list. They would be the dumbest things you could possibly do.

若要对商业机会进行风险调整回报率评估，制造火箭与汽车几乎会位列清单末端。这可能是你能做出的最愚蠢选择。

更多资源 https://mirrorsite.org

> Company stock value is not a metric by which I judge my own achievements.[589]
>
> 公司股价并非我衡量个人成就的指标。[589]

I had a lot of friends try to talk me out of starting a rocket company, because they thought it was crazy. Everyone thought it was a crazy idea. Some people had actually tried to start rocket companies before and failed. They tried to talk me out of it too.[590]

当时许多朋友试图劝说我放弃创立火箭公司，他们认为这想法过于疯狂。所有人都觉得这是个疯狂的想法。事实上，之前就有人尝试创办火箭公司，但都失败了。他们也试图劝我放弃。[590]

One good friend compiled a bunch of footage of rocket failures and forced me to watch it. I said, “I’ve seen them all already.”[591]

一位好友整理了火箭失败的影像集锦，非要我看。我说：“这些我都看过了。”[591]

I think these people misunderstood my premise. When I started SpaceX, it was not with the expectation of success. I thought the most likely outcome was failure.

我认为这些人误解了我的前提。当初创立太空探索技术公司时，我并未预期会成功。我认为最可能的结果就是失败。

Their premise for talking me out of it was, “You’re going to lose the money you invest.” I replied, “Well, that was my expectation anyway, so I don’t really mind!”

他们劝退我的理由是'你会赔光投资的钱'，我回答：'反正我本来就预期会失败，所以无所谓！'

更多资源 https://mirrorsite.org

I mean, I mind losing money, but it's not like I was trying to figure out the rank-ordered best way to invest my money and on that basis chose space. I didn't think, "I could do real estate, or invest in shoemaking, and—whoa! Space has the highest ROI!" That was not my premise.[592]

我当然不想亏钱，但这并不意味着我试图寻找优先级排序的最佳投资方式，并因此选择太空领域。我并没有想过'我可以做房地产，或者投资制鞋业——哇！太空的投资回报率最高！'这不是我的出发点。[592]

There have been many times where I expected to lose everything. Who starts a car company and a rocket company expecting them to succeed? Certainly not me. I thought they both had a low chance of success, less than 10 percent. Maybe 1 percent, I don't know. Frankly, I wasn't wrong.[593]

曾有许多次，我都预料会失去一切。谁会创办汽车公司和火箭公司还指望成功？反正不是我。我认为两者成功概率都很低，不到10%。 也许只有1%，我也不确定。坦白讲，我的判断没错。[593]

We must be optimistic. There's no point in being pessimistic. It just doesn't help. My theory is you'd rather be optimistic and wrong about the future than pessimistic and right. If you're pessimistic, you're going to be miserable. Might as well enjoy the journey.[594]

我们必须保持乐观。悲观毫无意义，它毫无助益。我的理论是：宁可对将来持乐观态度却犯错，也不要悲观却正确。倘若悲观，你只会痛苦不堪。不如享受这段旅程。[594]

Q: How did you go about creating belief and support for the Mars mission?

问：您如何为火星任务建立信念并争取支持？

> If you're trying to convince the public to do something, you have to think about what will excite people.

更多资源 https://mirrorsite.org

若要说服公众支持某项事业，必须思考什么能激发人们的热情。

What message are we going to try to convey? What will people respond to? What would I respond to if I was an objective member of the public?

我们要传递什么信息？公众会如何回应？若作为普通公众一员，我自己会作何反应？

I thought we could send a small greenhouse to the surface of Mars, with seeds and a nutrient gel to hydrate the seeds upon landing.[595]

我考虑向火星表面发送一个小型温室，携带种子和营养凝胶，着陆后凝胶遇水溶解为种子提供养分。[595]

The greenhouse mission would be the first life on another planet, as far as we knew. The farthest life had ever traveled. We would have a great picture of green plants on a red background. That's the money shot. People tend to respond to precedents and superlatives.

据我们所知，这项温室任务将成为另一颗星球上的首次生命存在。这是生命迄今抵达的最远距离。我们将获得红色背景下绿色植物的绝佳画面，这就是关键画面。人们往往对先例和极致案例产生强烈反应。

I thought getting a greenhouse on Mars would get people excited about sending humans there. My original goal was to get the public excited, to get NASA's budget increased to get a mission to Mars funded.[596]

我认为在火星建立温室会激发人类登陆火星的热情。我最初的目标是唤起公众热情，推动美国国家航空航天局增加预算，为火星任务提供资金支持。[596]

I was willing to spend half the money I got from PayPal, so $90 million, on this mission with no expectation of return. This was just something important to accomplish. If I spent $90 million to get NASA a bigger

更多资源 https://mirrorsite.org

budget, which resulted in us going to Mars, that would be a good outcome.[597]

我愿意花掉PayPal收益的一半（9000万美元）投入这项任务，且不期待任何回报。这本身就是值得完成的重要使命。若用9000万美元换来美国国家航空航天局预算提升，最终促成火星之旅，那将是理想成果。[597]

Also, I was trying to figure out if I could afford to build a spacecraft. I wanted to budget for two missions because if we only did one and it failed, it might actually deter people from trying in the future.[598]

同时，我也在评估自身是否有能力承担航天器的建造。我计划为两次任务做预算，因为若只进行一次却失败，可能会阻碍未来的尝试。[598]

I was able to get the cost of the spacecraft, communications, and the little greenhouse down. But the one thing I couldn't compress was the cost to launch. There were only a few options, and the US options were way too expensive. I ended up going to Russia three times to try to buy the biggest intercontinental ballistic missile (ICBM) in the Russian nuclear fleet. That didn't work out.[599]

我成功压缩了航天器、通信系统和小型温室的成本。但唯一无法压缩的是发射成本。可选方案屈指可数，而美国的选项又过于昂贵。我三次前往俄罗斯，试图购买俄核武库中最大的洲际弹道导弹（ICBM），但最终未果。[599]

In doing this, I realized what we really need to do is improve the technology of space transportation.[600] I wanted to hold out hope that humans could be a space-faring civilization, out there among the stars. There was no chance of that unless a new company was started to create revolutionary rockets.[601]

In doing this, I realized what we really need to do is improve the technology of space transportation. | 在此过程中，我意识到真正需要提升的是太空

更多资源 https://mirrorsite.org

运输技术。[600] 我期盼人类能成为星际遨游的太空探索文明。除非成立新公司研发革命性火箭，否则此事绝无可能。[601]

If a startup didn’t do something to advance rocket technology, it wouldn’t happen. Either it’s coming from a startup or it’s not happening at all. A small chance of success is better than no chance of success. So I started SpaceX in mid-2002, expecting to fail.[602]

若初创企业不推动火箭技术发展，这一切就不会实现。要么由初创企业实现，要么就根本不可能实现。微小的成功概率总比毫无机会强。因此我在2002年年中创办了太空探索技术公司，当时就做好了失败的准备。[602]

Q: Why did you decide to fund SpaceX yourself?

问：为何决定自筹资金创办太空探索技术公司？

After PayPal was sold, I started debating between working on solar, electric cars, or space. I figured space would be the least likely to succeed, so least likely to attract other entrepreneurs. Nobody else was crazy enough to do space. I thought I’d better work on space first.

PayPal出售后，我开始在太阳能、电动汽车或太空领域之间权衡创业方向。我认为太空领域成功率最低，因而最不可能吸引其他企业家。当时没有其他疯子愿意涉足太空领域。我觉得最好先从太空领域着手。

My first idea, the greenhouse mission, would have a 100 percent chance of losing all the money associated with it. If anything, starting a rocket company had less than a 100 percent chance of losing all the money associated with it. From my perspective, it was actually less risky than the first idea, which was just paying to send the greenhouse to Mars.[603]

我的首个构想——温室任务，百分之百会赔光所有投入资金。相较之下，创办火箭公司赔光本金的概率反而不到百分之百。在我看来，这

更多资源 https://mirrorsite.org

实际上比单纯花钱把温室送上火星的首个构想风险更低。[603]

> The likeliest outcome is I will lose all my money.
>
> 最可能的结果是我将赔光所有资金。
>
> But what's the alternative? No progress in space exploration?
>
> 但除此之外还有其他选择吗？太空探索领域毫无进展？
>
> We've got to give this a shot, or we're stuck on Earth forever.[604]
>
> 我们必须奋力一搏，否则将永远困在地球上。[604]

I would not recommend a space company to first-time entrepreneurs. Space is advanced entrepreneuring. You're better off starting something that requires little capital first. Space is definitely a high-capital effort.[605]

我不会向初次创业者推荐创办太空公司。太空领域属于高阶创业。你最好先从资本需求较低的领域起步。太空事业无疑是高资本投入的领域。[605]

I'm a big believer in this: Don't ask investors to invest their money if you're not prepared to invest your money. It doesn't seem right to me to ask other people to invest if you don't also invest. I'd rather lose my money than any of my friends' money or investors' money.[606]

更多资源 https://mirrorsite.org

我坚信这一点：如果你不准备投入自己的资金，就别要求投资者掏钱。如果自己都不投资却要求他人注资，这在我看来不合情理。我宁愿损失自己的钱，也不愿让朋友或投资者的资金受损。[606]

I didn’t even seek investor funding for the first three rounds of SpaceX because the first thing investors want to ask you is, “Tell us about prior successes in this field. What can we compare this to?” When you have about zero in the success category and a cemetery full of failures, they’re not too keen. Rockets are pretty far out of the comfort zone of most venture capitalists.

太空探索技术公司前三轮融资我甚至没寻求投资，因为投资人首先就会问：'请谈谈这个领域过往的成功案例'这该如何形容？当你成功案例几乎为零，失败累累如墓园时，他们自然不会太热衷。火箭领域远远超出大多数风险投资家的舒适区。

We were able to get venture funding after we demonstrated we were almost able to get to orbit. Credit goes to Founders Fund, my compatriots from PayPal: Peter Thiel, Luke Nosek, Ken Howery, and the guys. They invested before we got to orbit, so credit to them.

在我们证明几乎能够抵达轨道后，才成功获得风险投资。这要归功于创始人基金，我的PayPal战友们：彼得·蒂尔、卢克·诺塞克、肯·豪瑞等人。他们在我们抵达轨道前就进行了投资，值得称赞。

Rockets are hard. I had never made physical stuff before SpaceX, let alone rockets. I had to show I could actually make stuff.[607]

火箭制造绝非易事。在太空探索技术公司之前，我从未制造过实物，更遑论火箭。我必须证明自己具备实际制造能力。[607]

Once we started building a space launch company, I predicated the strategic plan on a known market, something I know for a fact exists: the need to put small- to medium-sized satellites into orbit. We served that need initially. With that as a base of revenue, we could eventually move into the human transportation market.[608]

更多资源 https://mirrorsite.org

当我们开始创建太空发射公司时，我将战略规划建立在已知市场基础上——这个我确信存在的需求：将小型至中型卫星送入轨道。 我们最初满足了这一需求。以此作为收入基础，我们最终得以进军人类运输市场。[608]

First, we built an orbital launch vehicle. A high mass-efficiency launch vehicle targeted to solving the satellite delivery market. Our approach was to make this a solid, sound business from the beginning.[609]

首先，我们研制了轨道运载火箭。这款高效能运载火箭专为解决卫星运输市场需求而设计。我们的策略是从初创阶段就构建稳健可靠的商业模式。[609]

The long-term aims of the company were always human transportation. But I think the smart strategy was to first go for cargo delivery, putting satellites into orbit. Our eventual upgrade path was to build Starship, the successor to Saturn V rocket, a superheavy-lift vehicle that could be used for setting up a moon base or doing a Mars mission. That is our holy grail objective.[610]

公司的长期目标始终定位于人类运输领域。但我认为明智的策略是优先开拓货物运输市场，实现卫星入轨服务。我们最终的升级路径是研制'星舰'——土星五号火箭的继任者，这款超重型运载火箭可支持月球基地建设或执行火星探测任务。那是我们追求的终极目标。[610]

更多资源 https://mirrorsite.org

ROCKETS FROM FIRST PRINCIPLES

基于第一性原理的火箭

> I was trying to figure out if there was something fundamentally superexpensive about rockets.[611]
>
> 我当时试图探究火箭是否存在根本性的超高成本因素。[611]

Q: How did you determine whether your vision for SpaceX had the potential to succeed?

问：您如何判定太空探索技术公司的发展愿景具有成功潜力？

How could the Russians build low-cost rockets? It's not like we drive Russian cars, fly Russian planes, or have Russian kitchen appliances. The US is a pretty competitive place, and we should be able to build a cost-efficient launch vehicle.[612]

俄罗斯人如何能制造出低成本火箭？我们既不开俄罗斯车，也不坐俄罗斯飞机，更不用俄罗斯厨具。美国是高度竞争的市场，我们理应能研制高性价比运载火箭。[612]

I started reading quite a bit about rockets, trying to understand why they're so friggin' expensive. It used to be $60 million to build the Delta II. Now, a Delta II costs $100 million to make. Crazy number. Delta II is a relatively small rocket! The bigger rockets are anywhere from $200 to $400 million.

我开始大量研读火箭资料，试图解析其价格高昂的根本原因。德尔塔II火箭制造成本曾为6000万美元，如今却需1亿美元。简直荒谬。德尔塔II型是相对小型的火箭！大型火箭的造价在2亿至4亿美元之间。

更多资源 https://mirrorsite.org

> I was pretty mad, and when I get mad I try to reframe the problem.[613]
>
> 我当时相当暴怒，而当我暴怒时，我会尝试重构问题。[613]

I looked at the suppliers NASA had been relying on. With suppliers like Boeing and Lockheed, you're screwed.[614]

我研究了NASA长期依赖的供应商。面对波音和洛克希德这类供应商，你只会束手无策。[614]

One problem with those big aerospace firms is incredible aversion to risk. Even if better technology is available, they still use legacy components, often ones that were developed in the 1960s. Everyone is trying to optimize their ass-covering.[615]

这些大型航天企业存在一个关键问题：对风险有着令人难以置信的规避态度。即便有更先进的技术可用，他们仍坚持使用遗留组件——其中许多还是20世纪60年代开发的产物。所有人都在竭力优化自己的明哲-保身策略。[615]

Second, there's a tendency in big aerospace companies to outsource everything. That's been trendy in many industries, but aerospace has done it to a ridiculous degree. They outsource to subcontractors, and then the subcontractors outsource to sub-subcontractors, and so on. You have to go four or five layers down to find somebody actually doing real work—cutting metal, shaping atoms. Every level above that tacks on cost—it's overhead to the fifth power. I began to understand why things were so expensive.[616]

其次，大型航空航天企业普遍存在全面外包的倾向。这虽是众多行业的流行趋势，但航天领域已将其推向荒谬的极致。他们将业务外包给分包商，分包商又转包给次级-分包商，形成层层转包链。往往需要追

更多资源 https://mirrorsite.org

溯四五级承包商，才能找到真正从事实际工作的人——比如切割金属、塑造原子层面的实体制造者。每提升一个层级，成本就叠加一次——管理开支呈现五倍级增长。我开始明白为何成本如此高昂。[616]

Boeing and Lockheed just want their cost-plus gravy trains. When you've had success for too long, you lose the desire to take risks. We can't get to Mars with that system. They have an incentive to never finish the job.[617]

波音公司和洛克希德公司只想守着他们的成本加成稳赚模式摇钱树。当成功持续太久，人们就会丧失冒险的欲望。靠那种体系我们无法抵达火星。他们存在故意拖延完工的动机。[617]

There wasn't really a good reason for rockets to be so expensive. Rockets could be a lot cheaper *even if they were still expendable*. But, *if* one could make them reusable, like airplanes, then the cost of rocketry and space travel would both drop dramatically.[618]

火箭成本居高不下实在缺乏充分理由。即便采用一次性设计，火箭成本仍可大幅降低。但若能实现可重复使用——像飞机那样，火箭技术和太空旅行的成本都将急剧下降。[618]

I put together a feasibility study with a team of engineers who were involved in all major launch vehicle developments over the last thirty years. We met over a number of Saturdays in early 2001 to find the smartest way to approach launch cost and reliability, and we came up with a default design.[619]

我召集了参与过去三十年所有主要运载火箭研发的工程师团队，共同完成了可行性研究。2001年初的多个周六，我们共同研究降低发射成本和提升可靠性的最佳方案，最终确立了默认设计架构。[619]

It was fortunate timing. The feasibility study finished around the time we agreed to sell PayPal to eBay. So coincidently with that sale, I moved down to Los Angeles, the biggest concentration of aerospace talent in the world.[620]

更多资源 https://mirrorsite.org

时机恰到好处。可行性研究完成之际，我们刚与eBay达成PayPal出售协议。恰逢交易完成，我随即迁往洛杉矶——全球航天人才最密集的区域。[620]

Q: Did people give you a hard time for this? It seems like a lot of people were saying “Elon is a software guy. Why is he working on hardware?”

问：当时是否遭遇外界质疑？当时普遍存在质疑：'埃隆是软件背景出身，为何涉足硬件领域？'

One hundred percent. A lot of the press from that time is still online. They kept calling me an “internet guy” attempting to build a rocket company. We got ridiculed quite a bit.

完全属实。当年的媒体报道至今仍可在线查阅。媒体持续将我称为'试图创建火箭公司的互联网人'。 我们承受了相当多的嘲讽。

It does sound absurd. “Internet guy starts rocket company” doesn’t sound like a recipe for success, frankly, so I don’t hold it against them. It does sound improbable, and I agreed. It was improbable.[621]

此事确实显得荒诞。坦白说，'互联网人创建火箭公司'本就不像成功方程式，故我对此并无芥蒂。这确实概率极低，我完全认同——本就是小概率事件。[621]

I didn’t study rocket science but have picked it up along the way.[622]

我从未学过火箭科学，但已在实践中逐步掌握。[622]

I didn’t really know how to start a rocket company. The first three launches failed. I did not hit the bull’s-eye.[623]

更多资源 https://mirrorsite.org

最初我完全不懂如何创办火箭公司。前三次发射全部失败。我未能命中靶心。[623]

更多资源 https://mirrorsite.org

KEEPING SPACEX ALIVE

维系太空探索技术公司生存

> SpaceX is in this for the long haul and, come hell or high water, we are going to make this work.[624]
>
> 太空探索技术公司立足长远发展，无论面临何种挑战，我们都将达成使命。[624]

I thought if we couldn't get to orbit within three failures, we deserved to die. That was my going-in proposition.[625]

我曾认定：若三次尝试仍无法进入轨道，公司理应消亡。这是我最初的立场。[625]

In 2006, our first rocket landed a couple hundred yards away from the launch site in tiny fragments. The second attempt failed too. But, we got further each time.[626] In 2008, we had the third failure in a row of the Falcon rocket. I had only budgeted for three attempts.[627]

In 2006, our first rocket landed a couple hundred yards away from the launch site in tiny fragments. The second attempt failed too. But, we got further each time. | 2006年，我们首枚火箭的残骸散落在距发射场数百码处。第二次尝试同样失败，但每次我们都取得进展。[626] 2008年，猎鹰火箭遭遇接连第三次失败。我只预算了三次尝试的资金。[627]

That's when I split all the money I had left between Tesla and SpaceX. It was enough to afford a fourth launch at SpaceX, if we moved super fast.[628]

更多资源 https://mirrorsite.org

那时我把剩余资金全部分配给特斯拉和太空探索技术公司。只要全速推进，这笔钱足够支持第四次火箭发射。[628]

I collected everyone in the conference room and said, “We have one last rocket. Get your shit together, go back to the island, and launch it. You have six weeks.”[629]

我将全员召集至会议室宣布：“我们还拥有最后一枚火箭。立即重整旗鼓，返回海岛基地执行发射。你们只有六周期限。”[629]

Here was my email to the team: “There should be absolutely zero question that SpaceX will prevail in reaching orbit and demonstrating reliable space transport. For my part, I will never give up and I mean never. Thank you for your hard work. Now, on to flight four.”[630]

致团队邮件原文：“太空探索技术公司必将成功进入轨道并实现可靠太空运输，这一点毋庸置疑。就我而言，永不放弃，永不妥协。感谢诸位辛勤付出。现在，全力备战第四次飞行。”[630]

If we didn’t succeed, we would be pointed to as a reason people shouldn’t even try these things. We must do whatever is necessary to keep going.[631]

倘若失败，我们将成为世人放弃尝试的例证。我们必须不惜一切代价持续推进。[631]

> I don’t ever give up. I’d have to be dead or completely incapacitated.[632]
>
> 我永不放弃，除非死亡或完全丧失行动能力。[632]

It was an interesting exercise in karma. After I got ousted by the PayPal coup leaders, I could have said “You guys suck,” but I didn’t. If I’d done

更多资源 https://mirrorsite.org

that, Founders Fund wouldn’t have come through with an investment in SpaceX in 2008 and the company would be dead. Karma may be real.[633]

这是因果律的生动例证。被PayPal政变领导者排挤出局后，我本可以说'你们这群混蛋'，但我没有这么做。如果当时那样做了，创始人基金就不会在2008年投资太空探索技术公司，公司早就倒闭了。因果报应或许真的存在。[633]

If the fourth launch hadn’t worked, that would have been curtains. I had no money left. It was a pretty close thing. We would have joined the graveyard of prior rocket startups.[634]

如果第四次发射失败，一切就彻底结束了。我已身无分文。当时真是千钧一发。我们可能就会加入先前火箭初创企业的坟墓。[634]

I thought the odds of the fourth launch working were better than 50 percent. There was just a little change in the thrust transient of the first-stage engine we couldn’t see on the ground. That made the difference. Fortunately, the fourth SpaceX launch worked.[635]

我认为第四次发射成功的概率超过50%。 只是第一级发动机推力瞬变中出现了地面无法观测的微小变化。正是这点变化决定了成败。所幸第四次发射成功了。[635]

> We almost went down as the company that made it to orbit, then died.
>
> 我们险些成为进入轨道后便消亡的企业。

When it worked, my cortisol levels were clinically high. I couldn’t feel celebratory. There was no jubilation. I was too stressed. Getting to orbit meant, “Okay, we’re not going to die today.” We’ll live a little bit longer. I just felt relief.[636]

更多资源 https://mirrorsite.org

成功那一刻，我的皮质醇水平达到了临床上的高度。我无心庆祝。毫无欢欣。我压力太大了。成功进入轨道意味着'今天不用死了'。我们能多活一阵子。我只感到如释重负。[636]

But it was short-lived. We were still in a tough position. It was not like we had customers lined up. Even the fourth launch working wasn’t enough to succeed. We also needed a big contract to keep us alive.[637]

但转瞬-即逝。 我们还没脱离困境。根本没有客户排队等候。即使第四次发射成功也不足以扭转局面。还需要一份大合同才能活下去。[637]

更多资源 https://mirrorsite.org

LANDING NASA CONTRACTS

赢得NASA合同

After the successful launch, as I was scrambling to fundraise for Tesla in 2008, NASA called out of the blue to tell me SpaceX had won a contract. I couldn’t believe it. I screamed, “I LOVE NASA. YOU GUYS ROCK,” then hung up. I called our president, Gwynne Shotwell, and told her to immediately sign whatever deal NASA offered.[638]

发射成功后，正当我2008年为特斯拉竭力融资时，美国国家航空航天局突然来电告知太空探索技术公司中标。难以置信。我大喊'我爱NASA！你们太棒了！'随即挂断。立即致电总裁格温·肖特维尔，要求她当场签署NASA提出的任何协议条款。[638]

It felt like I had been blindfolded and taken out to the firing squad. Then they yelled, “Fire” and the guns just went “click.” No bullets. Then they let me free. Sure, I was glad to be alive. But I was still pretty fucking nervous.[639]

感觉就像被蒙眼带到行刑队前。他们喊'开火'，枪却只发出'咔嗒'声。没有子弹。接着他们放了我。当然，活着让我庆幸。但我依然相当紧张。[639]

My estimate of success was not far off.

我的成功预判基本准确。

We just made it by the skin of our teeth.

更多资源 https://mirrorsite.org

> 我们仅是险胜。

We had developed the Dragon spacecraft somewhat opportunistically. NASA announced they were going to retire the space shuttle, and they didn't have the budget to develop a new vehicle with cargo transport capability to the space station.

龙飞船的开发带着见机行事的色彩。美国国家航空航天局宣布退役航天飞机，却无预算开发新型空间站货运飞船。

They put it out to bid for the first time in NASA history. It was quite a big step, and we were lucky enough to win one of those contracts. Then, the other company wasn't able to execute, and SpaceX ended up being the primary means of transporting cargo to and from the space station.[640]

这是NASA史上首次公开招标。此举意义重大，我们幸运中标。由于另一公司未能履约，太空探索技术公司最终成为空间站货运主力。[640]

Our rocket ended up costing around $6 million, super low compared to other rockets in that class, which were about $25 million. We're about a quarter of the price of Boeing or Lockheed. Once it was reusable, payload delivery could be two orders of magnitude cheaper.[641]

我们的火箭成本约600万美元，远低于同级火箭2500万美元的均价。我们的价格约为波音公司或洛克希德公司的四分之一。实现可重复使用后，有效载荷运输成本可降低两个数量级。[641]

After we did the first two space station resupply missions, which thankfully both worked, NASA said, "What about astronaut transport?" They put out a big competition and awarded two contracts for astronaut transport, one to Boeing and one to SpaceX. Now, we transport astronauts to and from the space station.[642]

更多资源 https://mirrorsite.org

在我们成功完成前两次空间站补给任务后（两次均获成功），美国国家航空航天局提出：'宇航员运输方案如何？' 随后发起大型竞标，最终授予波音公司和太空探索技术公司各一份宇航员运输合同。如今我们承担着往返空间站的宇航员运输任务。[642]

更多资源 https://mirrorsite.org

YOU HAVE TO BLOW THINGS UP

必须打破常规

> The first goal is to make the damn thing work—we'll optimize it later.
>
> 首要目标是确保基础功能实现——优化工作后续推进。

We want to push the envelope. If you don't push the envelope, you cannot achieve the goal of a fully and rapidly reusable rocket with high payload. It's not possible. You have to go close to the edge on margins.[643]

我们必须突破极限。不突破极限，就不可能实现高有效载荷、完全快速可重复使用火箭的目标。必须逼近设计余量的临界点。[643]

We intentionally iterate the design of the Starship at SpaceX rapidly. This is a fundamentally different optimization for Starship versus a polar extreme like our Dragon capsule. Since Dragon now carries crew, there can be no failures, ever. Everything's going to be tested. There can never be a failure, ever, for any reason whatsoever. With human crew in a developed vehicle, we're in extreme conservatism mode.

我们在太空探索技术公司刻意加速星舰设计的迭代进程。星舰的优化逻辑与龙飞船这类极端设计存在本质差异。既然龙飞船现在要载人，就绝不允许失败，永远都不行。所有系统都必须经过全面测试。无论出于何种原因，都绝不能出现失败，永远不行。在成熟载具中搭载人类时，我们处于极端保守模式。

Falcon is a little less conservative. It is possible for us to have, say, a failure with a booster on landing. That's not the end of the world. Early Starship

更多资源 https://mirrorsite.org

models were the polar opposite of Dragon. We were iterating rapidly to learn.[644]

猎鹰系列则相对不太保守。例如助推器着陆时出现故障，对我们来说是有可能的。这并非世界末日。早期星舰型号与龙飞船截然相反。我们通过快速迭代来积累经验。[644]

Q: Is that different from other space programs?

问：这与其他太空计划有何不同？

NASA's space shuttle had almost no iteration because there were people on board. You can't be blowing up shuttles. That lack of iteration was a problem. There were a lot of issues they were aware of, but people were too afraid to make changes to a design that had already worked. There was risk-reward asymmetry. If you make a change and something goes wrong, big punishment. If you make a change and it goes right, small reward.

NASA的航天飞机几乎没有迭代空间，因为每次任务都载人。航天飞机绝不能爆炸。这种迭代不足是个问题。他们明知存在诸多缺陷，但没人敢对已成功的设计进行改动。这里存在风险-回报不对称。若变更引发问题，必施重罚。若变更成效显著，仅予轻奖。

They had seen the issues with the O-ring and the insulation coming off and hitting the wing before, but there had not been a catastrophe. They figured it was good enough because it worked before. But that's like Russian roulette: "Look, I've pulled the trigger and I'm fine."

他们曾目睹O型密封圈故障及隔热层脱落撞击机翼的情况，但此前未酿成灾难。他们认为既然此前有效，就说明足够可靠。这如同俄罗斯轮盘赌：'看，我扣了扳机却安然无恙'。

It's hard to iterate when people are on board every mission. Starship does not have anyone on board during early trials so we can blow things up, learn, and iterate. That's really helpful. To improve safety, you need to fly a

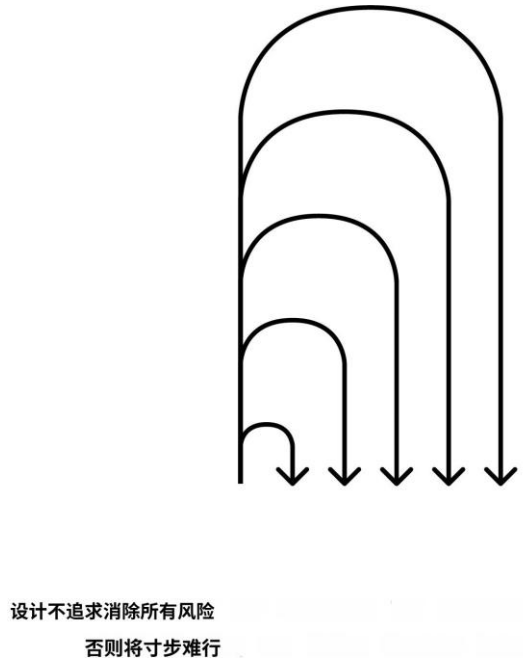
更多资源 https://mirrorsite.org

lot and have a lot of redundancy. So if you lose an engine on the booster, it doesn't matter. Even losing multiple engines shouldn't matter.[645]

载人飞行将阻碍快速迭代。星舰初期试飞不载人，可炸毁设备、汲取教训、持续优化，此模式极具实效性。提升安全性需高频次飞行与多重冗余设计。故助推器损失单台发动机无碍大局。即便损失多台发动机亦不应影响任务。[645]

> We don't want to design to eliminate every risk. Otherwise, we will never get anywhere.[646]
>
> 我们绝不追求彻底消除所有风险的设计理念。否则我们将永远无法取得进展。[646]

更多资源 https://mirrorsite.org



Before every Starship launch, we go through the list of risks we predict, which we call the “risk list.” If you look at various reasons why we blew up, none of the reasons they blew up were on our “risk list.” There’s a crazy amount of new technology, all evolving simultaneously. We need time and trials to iron out the unknown unknowns.[647]

每次星舰发射前，我们都会梳理预测的风险清单。回顾历次爆炸事故，没有一次是由清单上的已知风险引发的。大量创新技术正在同步

更多资源 https://mirrorsite.org

演进，这带来了超乎预期的复杂挑战。我们需要时间和反复试验来消除未知风险。[647]

Q: What is the big-picture vision SpaceX is iterating toward?

问：太空探索技术公司迭代追求的宏大-愿景是什么？

The overarching optimization is: “What is the fastest time to a city on Mars?”

最高层级的优化目标是：'建立火星城市的最短周期是多少？'

Then subset → fastest time to a fully usable rocket.

其子目标→研发完全可用火箭的最短周期

And subset → fastest time to orbit.[648]

更下一层→实现轨道飞行的最短周期[648]

Initial production was simply a learning exercise. None of the initial designs will be long term. We’re just trying to learn in the shortest period of time. The early Starship assembly yard looked like a garage shop, to be frank. It’s weird—we have superadvanced technology being built in a tent in a parking lot.

初期生产本质上只是学习过程。所有初始设计均非长久之计。我们正全力缩短学习周期。坦白说，早期星舰组装场简陋如工棚。很怪异——尖端技术竟在停车场的帐篷里建造。

Early versions of Starship didn’t even have doors. We didn’t need doors. We did need to be superfocused on getting to orbit. Then superfocused on getting the ship back. Doors were just unnecessary complexity. The first ten ships (or more) we won’t get back from orbit. We probably won’t be flying them again. Maybe once or twice—if we’re lucky.[649]

更多资源 https://mirrorsite.org

初代星舰连舱门都没有，我们本就不需要。当时必须全力聚焦轨道突破。继而全力攻克飞船回收。舱门只是徒增复杂度。前十余艘星舰恐难从轨道返回。大概率无法复飞。若运气够好，或许能复用一两次。[649]

Eliminate what isn’t necessary to solve the key problem.[650]

消除解决关键问题外的冗余环节。[650]

更多资源 https://mirrorsite.org

BUILDING THE JUST BARELY POSSIBLE

打造近乎可行的方案

> I was told many times rocket reusability was impossible.[651]
>
> 火箭可重用性曾被多次断言不可能。[651]

One of the hardest engineering problems known to man is making a reusable orbital rocket.

可重复使用轨道火箭是人类最艰难的工程学难题之一。

We have reusability in bicycles, cars, and airplanes. It’s bizarre to not have reusability in another form of transport. It would be insane to chuck a boat away after every trip. Getting one trip every four days would not cut it in a car. But this is how rockets have worked thus far.[652]

自行车、汽车和飞机都已实现可重用性。其他交通工具不具备可重用性，这实在匪夷所思。每次航行后就把船扔掉，简直是疯狂之举。汽车若四天才用一次根本行不通，但火箭迄今为止正是如此运作。[652]

The design goal is immediate reflight. Refill propellants and go again, just like any other mode of transport. This is gigantic.[653]

设计目标在于实现即刻复飞。加注推进剂即可再次启程，如同其他交通工具。这具有划时代意义。[653]

更多资源 https://mirrorsite.org

> Getting to orbit was solved in the 1950s. The math clearly demonstrates there is no point in another expendable rocket; you have to achieve reusability.[654]
>
> 进入轨道的问题早在1950年代就已攻克。数学计算清晰表明：再造一次性火箭毫无意义；必须实现可重用性。[654]

It’s not like other rocket scientists were huge idiots who wanted to throw their rockets away all the time. It’s hard to make something like this. Nobody has ever succeeded, and for a good reason. Earth’s gravity is heavy. On Mars this would be no problem. Moon, piece of cake. On Earth, fucking hard. Just barely possible.

并非其他火箭科学家都愚蠢透顶，执意抛弃火箭。实现这样的技术难度极高。从未有人成功过，这绝非偶然。地球引力作用巨大。在火星上不成问题。月球上易如反掌。但在地球上却难上加难，仅存理论可能。

A fully reusable orbital system would be one of the biggest breakthroughs in the history of humanity. That’s why it hurts my brain. We’re just a bunch of monkeys. How did we even get this far? It beats me. We were swinging through the trees eating bananas not long ago.[655]

完全可重用的轨道系统将成为人类历史上最重大的突破之一。这让我头疼。我们不过是一群猴子。我们究竟如何走到今天？我也百思不得其解。不久前我们还在树丛间荡来荡去，吃着香蕉。[655]

> Can you imagine if human civilization continued at the current pace of technological advancement for another million years? Where would we be?

更多资源 https://mirrorsite.org

> 你能想象人类文明以当前技术进步速度再延续百万年吗？那时我们会是什么模样？

I told my team, “Imagine there was a pallet of cash plummeting through the atmosphere and it was going to burn up and smash into tiny pieces. Would you try to save it? You probably would.”[656]

我告诉团队：'想象有托盘现金正从天而降，它即将烧毁并摔得粉碎。你们会尝试挽救它吗？大概会的。'[656]

When people tried to make a reusable system before, they would conclude success was not one of the possible outcomes. In government programs, of course, the program would still continue for quite some time. It’s funny but it’s true.[657]

过去人们尝试制造可重用系统时，总会认定成功不在可能结果之列。在政府项目中，即便失败，计划仍会持续相当长时间。这可笑但却是事实。[657]

The space shuttle attempted some level of reusability, but it ended up costing more per flight than an expendable vehicle of equivalent capability. For a long time, people pointed to the space shuttle as an example of why attempting reusability was dumb. But you can’t take a single example and make an entire theory out of it.[658]

航天飞机曾尝试实现部分可重用性，但最终单次飞行成本反而超过了同等运力的一次性航天器。长期以来，人们总以航天飞机为例，证明尝试可重用性是不明智之举。但你不能仅凭一个例子就构建出完整的理论体系。[658]

I wasn’t sure if it was possible when we started SpaceX, but after a few years of work I became convinced. Full and rapid reuse is possible. It is possible to make this work, and that gave me hope. Of course, just because something is possible does not mean it will occur.[659]

更多资源 https://mirrorsite.org

创办太空探索技术公司时，我并不确定其可行性，但经过数年努力后我对此深信不疑。完全快速的可重用性是切实可行的。实现这一目标具有可能性，这给予了我希望。当然，某事具备可能性并不意味着它必然发生。[659]

> The first step is to establish that something is possible, then the probability it will occur.[660]
>
> 首要步骤是确认某事具有可能性，继而评估其发生的概率。[660]
>
> In no prior design was full reusability one of the possible outcomes.[661]
>
> 在先前所有设计中，完全可重用性从未被列为可能实现的结果。[661]

SpaceX's Falcon 9 was the first rocket with any reusability. We bring the boosters back and refly them. Only the upper stage is expended. Falcon 9 is not *rapidly* reusable because most boosters land on a ship in the ocean. It takes a while to bring it back, fuel, and reuse it. Falcon 9 first had reusability measured in months, then weeks, and now finally days. But, the efficiency is limited. We can't bring it lower than several days.[662]

太空探索技术公司的猎鹰9号是首款具备可重用特性的火箭。我们将助推器回收并实现复用。仅上层推进级属于一次性消耗品。猎鹰9号不具备快速可重用性，因其多数助推器需降落在海上回收船。回收、加注燃料和重新使用需要时间周期。猎鹰9型火箭的可重用性指标从最初的数月，逐步缩短至数周，如今已实现以天为单位。但效率存在天花板。我们无法将周期压缩至数天以内。[662]

更多资源 https://mirrorsite.org

Knock on wood, Falcon 9 is the most reliable rocket in the world and launches about every two to three days.[663] Every one has come home safely, which is the most important thing. We learned a tremendous amount from the Falcon program that fed into the Starship program.[664] We wouldn't have been able to make Starship without the benefit of Falcon 9.[665]

Knock on wood, Falcon 9 is the most reliable rocket in the world and launches about every two to three days. | 值得庆幸的是，猎鹰9号保持着全球最高可靠性的火箭记录，平均每两到三天执行一次发射任务。[663] Every one has come home safely, which is the most important thing. We learned a tremendous amount from the Falcon program that fed into the Starship program. | 所有火箭均平安返航，这是最关键的成就。猎鹰项目积累的宝贵经验，为星舰项目的研发奠定了技术基础。[664] 若没有猎鹰9号的技术积淀，星舰的研制将无从谈起。[665]

> Nobody thought this was possible. But we're not breaking any laws of physics, so we knew it was possible.[666]
>
> 当时业界普遍认为这不可行。但该方案完全符合物理学定律，我们始终坚信其可行性。[666]

Starship is the largest flying object of any kind. It's five thousand tons at liftoff, much heavier than any other aircraft, ever. The body diameter is nine meters (roughly fifty feet). It will get taller with newer versions too. And it's going straight up; aircraft don't go straight up. It's an insanely gigantic thing, twice the size of Saturn V, previously the largest rocket ever built.[667]

星舰是人类航空史上体积最大的飞行器。其升空质量达五千吨，远超人类制造过的任何航空器。箭体直径达九米（约合五十英尺）。 后续迭代版本还将继续增加高度，并将采用垂直升空模式；飞行器不会垂

更多资源 https://mirrorsite.org

直上升。这是个极其巨大的装置，体积达到土星五号的两倍——后者曾是历史上最大的火箭。[667]

There could be other solutions too, but this will work. The first order of business was to get one that works. Now we optimize.[668] Full and rapid reusability will work. It's just a question of how many attempts we need to make it work, and then make it work really well.[669]

There could be other solutions too, but this will work. The first order of business was to get one that works. Now we optimize. | 可能还存在其他解决方案，但这套方案切实可行。首要任务是确保方案可行。现在我们进行优化。[668] 全面而快速的可重用性将发挥效用。关键只在于需要多少次尝试才能使其运转，进而实现卓越效能。[669]

It has to be true reuse, which means *rapid* and *complete* reuse. The problem with the space shuttle was only a portion of the system came back, and the reusable parts were incredibly difficult to refurbish. Reuse matters more if it's rapid and complete—if the only thing we do between flights is maintenance and refuel, like an airplane.[670]

必须是真正的可重用，即迅速且完整的可重用。航天飞机的问题在于仅部分系统可回收，且可重用部件的翻新过程异常艰难。当可重用性具备快速且完整的特性时——如同飞机般仅需维护和补充燃料即可再次飞行——其价值才更为凸显。[670]

If there is no major work required between flights, then the cost of a flight approaches the cost of propellant. Nearly 80 percent of Starship's propellant is liquid oxygen, and a little over 20 percent methane, which are both very low-cost fuels. The fuel cost of a flight is maybe a million dollars or less.[671]

若飞行间隔无需重大检修，单次飞行成本将趋近于推进剂成本。星舰近80%的推进剂是液氧，略高于20%为甲烷，两者均属极低成本燃料。单次飞行的燃料成本可能仅需百万美元或更低。[671]

更多资源 https://mirrorsite.org

> Full and rapid reusability is the holy grail of rocketry because then you’re only constrained by propellant costs.[672]
>
> 全面快速的可重用性是火箭技术的终极目标，届时推进剂成本将成为唯一制约因素。[672]

Q: What made you remove the landing legs?

问：为何决定取消着陆支架？

We fight to save mass constantly, especially with the reusable upper stage, where nobody has ever succeeded.

我们持续为减轻质量而奋战，尤其在可重用上面级领域——此前从未有人在此取得成功。

Again here, we try to think in the limit of physics. The problem with landing legs is they add mass, we have to protect them during reentry, and we have to get a giant rocket from wherever it landed back onto the launch stand. That’s tricky. I was trying to think of the limit. What’s the fastest way to achieve reusability?

在此我们再度尝试以物理极限为思考框架。着陆支架的弊端在于：增加额外质量、再入时需额外防护，且需将巨型火箭从着陆点移回发射台——这相当棘手。我始终在探索极限的可能性。实现可重用的最快捷途径是什么？

It would be to land on the launch stand. Why not just have it land on the arms of the tower it launches from?[673]

理想着陆点应是发射台本身。为何不让火箭直接降回发射塔的接驳臂上？[673]

更多资源 https://mirrorsite.org

This is the best-case outcome for rapid reuse. It gets caught by the same arms that placed it in the launch ring. In principle, the superheavy booster can be reflown within an hour of landing. It comes back in about five minutes one way and then it gets caught by the tower arms, placed back in the launch mount, and then we refill propellant in about thirty to forty minutes and place a ship on top of it.[674]

这是最佳情境下的快速复用方案。火箭由放置它进入发射环的同一组机械臂捕获。理论上，超重型助推器可在着陆后一小时内重新升空。它单程约五分钟返回，由塔臂捕获后重新置于发射架，随后用三至四十分钟加注推进剂，并在顶部安装飞船。[674]

When we first talked about it, it sounded batshit crazy. To custom-build a giant tower to catch the heaviest flying object ever made with mechanical arms. Pluck it out of the air. But we did it.[675]

初次提出此构想时，听来简直荒谬绝伦。要定制建造巨型高塔，用机械臂接住史上最重的飞行器。从空中精准抓取——而我们做到了。[675]

It’s an epic sight: giant robot arms catching a giant rocket. This is much more efficient than having landing legs on the rocket itself.[676]

这是史诗般的景象：巨型机械臂捕捉巨型火箭。这比在火箭本体安装着陆支架高效得多。[676]

> I call it rapidly reusable, reliable rockets. RRRR. Space pirates.[677]
>
> 我称之为快速可重复使用、可靠火箭。四R。太空海盗。[677]

更多资源 https://mirrorsite.org

OPTIMIZING FOR MASS TO MARS

优化火星有效载荷质量

The thing we optimize for at SpaceX is cost per ton to orbit. When the goal is low cost per ton of payload to orbit, you can't cheat.

我们在太空探索技术公司优化的核心指标是每吨轨道成本。当目标是将有效载荷每吨轨道成本降至最低时，毫无捷径可走。

All early rockets were a test program. We expected them to explode. It's weird if they don't explode, frankly. To get a lot of payload to orbit at low cost, you have to run everything close to the edge.

所有早期火箭都是测试项目。我们预期它们会爆炸。坦率地说，它们不爆炸才奇怪。要实现低成本大规模轨道运输，必须将一切推向极限。

To get a meaningful payload to orbit, scale is important. We need to make things big. There is value to scale here. You don't see everything shipped by small pickup trucks; you see semi trailers. You see giant ocean cargo ships, not a bunch of small boats with outboard motors. Scale has value in itself. For example, the same computer that controls a tiny rocket controls the big rocket. The percentage weight of the electronics is significant in a small rocket but becomes vanishingly small in a big rocket.[678]

要输送有意义的有效载荷至轨道，规模至关重要。我们需要实现大型化。规模在此具有重要价值。货运主力并非小型皮卡，而是半挂卡车。远洋运输靠的是巨型货轮，而非加装舷外机的小船队。规模本身具有价值。例如，控制小型火箭的计算机系统同样适用于大型火箭。电子设备的重量占比在小型火箭中显著，但在大型火箭中却变得微不足道。[678]

更多资源 https://mirrorsite.org

The focus is to minimize cost per ton of payload to orbit, the surface of the moon, or Mars. I'll give you a sense of just how much we need to improve it. Right now, the cost per landed ton to the surface of Mars is more than a billion dollars. You can't count the heat shield, parachute, or landing systems—only the useful stuff. In the case of the Mars rovers, it's really just the rover. That is the useful thing. The rover weighs about a ton and costs a billion dollars to get to Mars. So currently it costs roughly a billion dollars per ton to Mars.[679]

核心目标是将每吨有效载荷送至轨道、月球或火星表面的成本最小化。以火星为例：当前每吨着陆火星的成本超过十亿美元。隔热罩、降落伞或着陆系统不计入载荷——仅计算有效载荷。以火星车为例，真正有效的载荷只有火星车本身。这才是有效载荷。火星车重约一吨，登陆火星需耗费十亿美元。因此当前火星运输成本约为每吨十亿美元。[679]

To build a self-sustaining city on Mars, that cost will have to be less than one hundred thousand dollars a ton. That would be ten thousand times better than the current state of the art, to put things into perspective.[680]

要在火星建立自给自足的城市，运输成本必须降至每吨十万美元以下。这意味着需要将当前技术水平提升一万倍。[680]

That's how much improvement is needed. Not a 10,000 percent increase, a 10,000-times increase. That's what Starship is intended to do: be ten thousand times better than the current state of the art. Orders and orders and orders of magnitude better. But, we're not breaking any laws of physics. This is possible.[681]

这正是所需的改进幅度。不是提升百分之万，而是提升一万倍。 星舰的使命正在于此：实现比现有技术先进一万倍的跨越。达成数个数量级的跃升式进步。然而，我们并未违背任何物理学定律。这是可行的。[681]

更多资源 https://mirrorsite.org

> When we started the Starship design it seemed utterly insane. Now it’s gone from utterly insane to merely late.[682]
>
> 启动星舰设计之初，这个构想显得荒诞不经。如今它已从极度疯狂变为仅仅是进度延迟。[682]

With full reusability, Starship 3 will cost significantly less per flight than tiny Falcon 1. That’s the difference between a fully reusable rocket and an expendable rocket. The fully reusable rocket with low-cost propellant actually costs less than a tiny expendable rocket.[683] By analogy, the cost of flying a 747 is obviously much less than a small airplane that gets thrown away.

With full reusability, Starship 3 will cost significantly less per flight than tiny Falcon 1. That’s the difference between a fully reusable rocket and an expendable rocket. The fully reusable rocket with low-cost propellant actually costs less than a tiny expendable rocket. | 凭借完全可重用性，星舰3的单次发射成本将远低于微型猎鹰1号。这正是完全可重用火箭与一次性火箭的本质区别所在。采用低成本推进剂的完全可重用火箭，实际成本低于微型一次性火箭。[683] 类比而言，运营747客机的成本显然远低于使用即弃型小型飞机。

Falcon 1 gets about half a ton to orbit. The Starship 3 will send four hundred times more payload for less than the cost of a Falcon 1. It’s mind-boggling that the giant thing can cost so much less than the small thing.[684]

猎鹰1号能将约半吨有效载荷送入轨道。星舰3号的有效载荷运载能力是猎鹰1号的四百倍，成本却更低。这个庞然大物的成本竟远低于小型火箭，实在令人难以置信。[684]

A lot of people talk a lot about the number of launches to orbit per year, but this is not really what matters. What really matters is the total useful

更多资源 https://mirrorsite.org

payload to orbit per year. If these were ocean ships, you'd be comparing a dinghy to a supertanker. They're not the same.[685]

许多人热衷于讨论每年入轨发射次数，但这并非关键所在。真正重要的是每年送入轨道的有效载荷总量。若以航海作比，这无异于将小艇与超级油轮相提并论，二者不可同日而语。[685]

> There must be things you're excited about, that you're glad to be alive for.
>
> 生命中总该有些让你热血沸腾、庆幸活着去追求的事物。
>
> For me, this is the most important reason to pursue the establishment of life on Mars.[686]
>
> 对我而言，这正是推动火星生命建设的最重要动因。[686]

There are various "great filters" that have the potential to end civilizations. One of the "great filters" to pass is whether we become a multiplanet species. Will humanity be one of those species that passes the great filter of going beyond one planet?[687]

诸多'大过滤器'的存在可能终结文明进程。能否成为多行星物种，正是人类必须跨越的'大过滤器'之一。人类能否成为成功跨越单行星局限这一大过滤器的物种？[687]

To become multiplanetary, the breakthrough we need to create is a rapidly reusable interplanetary transport system. This is right on the edge of impossible.[688]

更多资源 https://mirrorsite.org

要实现多行星文明，关键突破在于建立快速可重复使用的星际运输系统。这几乎处于不可能实现的临界点。[688]

That's the breakthrough SpaceX is really trying to achieve. What we've done so far is good; it's better. But it has been evolutionary—not yet revolutionary. We need the revolutionary thing to work.[689]

这正是太空探索技术公司全力追求的技术突破。我们目前的成果固然可喜，甚至更为出色。但这仍属渐进改良——尚未达成革命性突破。我们需要革命性突破才能实现目标。[689]

577 Isaacson, *Elon Musk*.

577 沃尔特·艾萨克森, 埃隆 马斯克

578 Dodd, "Starbase Tour, Part 2."

578 多德, 《星舰基地导览：第2部分》

579 Khan and Musk, "CEO of Tesla Motors and SpaceX."

579 可汗与马斯克，《特斯拉汽车公司和 太空探索技术公司首席执行官专访》

580 *Return to Space*, directed by Jimmy Chin and Elizabeth Chai Vasarhelyi, Netflix (2022).

580 重返太空，导演：金国威与伊丽莎白·柴·瓦沙瑞莉，Netflix（2022）

581 "The Future We're Building—and Boring."

581 《我们正在建造的未来——和 Boring公司》

582 Khan and Musk, "CEO of Tesla Motors and SpaceX."

582 可汗与马斯克，《特斯拉汽车公司与 太空探索技术公司首席执行官》

583 Khan and Musk, "CEO of Tesla Motors and SpaceX."

583 可汗与马斯克，《特斯拉汽车公司与 太空探索技术公司首席执行官》

584 "Elon Musk's Vision for the Future."

584 《埃隆·马斯克对未来 的愿景》

585 "'Why Does Space Inspire Us?' Elon Musk," SpaceX, December 5, 2011, YouTube video, 1:07, https://www.youtube.com/watch?v=_yDZY5_u8FQ.

更多资源 https://mirrorsite.org

585 “‘为什么太空能激励我们？埃隆·马斯克’，太空探索技术公司，2011年12月5日，YouTube视频，1:07，https://www.youtube.com/watch?v=_yDZY5_u8FQ。

586 “Why Does Space Inspire Us?”

586 “为什么太空能激励 我们？”

587 “Musk, Stanford GSB 2013.”

587 “马斯克，斯坦福商学院 2013。”

588 Urban, “The Cook and the Chef.”

588 厄本，《厨师与 主厨》。

589 “Elon Musk and the Frontier of Technology,” transcript, Think Tank with Ben Wattenberg, PBS, December 13, 2007, https://www.pbs.org/thinktank/transcript1292.html.

589 “埃隆·马斯克与技术的边界”，文字稿，本·瓦滕伯格主持的智库节目，PBS，2007年12月13日，https://www.pbs.org/thinktank/transcript1292.html。

590 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

590 可汗与马斯克，“特斯拉汽车公司首席执行官与 太空探索技术公司”。

591 “Elon Musk ‘Mars Pioneer Award’ Acceptance Speech: 15th Annual International Mars Society Convention,” The Mars Society, August 9, 2012, YouTube video, 33:00, https://www.youtube.com/watch?v=PK0kTcJFnVk.

591 “埃隆·马斯克'火星先锋奖'获奖感言：第15届国际火星学会年会”，火星学会，2012年8月9日，YouTube视频，33:00，https://www.youtube.com/watch?v=PK0kTcJFnVk。

592 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

592 可汗与马斯克，“特斯拉汽车公司与 太空探索技术公司首席执行官访谈”。

593 Dodd, “Starbase Tour, Part 2.”

593 多德，《星舰基地导览，部件 2》。

594 Rogan and Musk, “JRE #1169.”

594 罗根与马斯克，《JRE #1169》。

595 “Elon Musk's Vision for the Future.”

595 《埃隆·马斯克的未来愿景》。

596 “Elon Musk's Vision for the Future.”

596 《埃隆·马斯克的未来愿景》。

更多资源 https://mirrorsite.org

597 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

597 可汗与马斯克，《特斯拉汽车公司首席执行官与 太空探索技术公司》。

598 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

598 可汗与马斯克，《特斯拉汽车公司首席执行官与 太空探索技术公司》。

599 “Musk, Stanford GSB 2013.”

599 《马斯克，斯坦福商学院 2013》。

600 “Pando Monthly Fireside Chat.”

600 "月度炉边谈话"

601 Isaacson, *Elon Musk*.

601 沃尔特·艾萨克森, 埃隆 马斯克.

602 “Elon Musk: Digital Superintelligence,” Y Combinator.

602 "埃隆·马斯克：数字超级智能", Y Combinator.

603 “Musk Mars Pioneer Award Speech.”

603 “马斯克火星先锋奖 演讲”

604 Isaacson, *Elon Musk*.

604 沃尔特·艾萨克森，《埃隆 马斯克》

605 “Musk's 2003 Stanford Lecture.”

605 “马斯克2003年斯坦福大学 讲座”

606 “2016 Annual Shareholder Meeting,” Tesla.

606 “2016特斯拉年度股东大会”

607 “Pando Monthly Fireside Chat.”

607 “潘多月度炉边谈话”

608 “Musk's 2003 Stanford Lecture.”

608 “马斯克2003年斯坦福大学讲座”

609 “Musk's 2003 Stanford Lecture.”

609 “马斯克2003年斯坦福大学讲座”

更多资源 https://mirrorsite.org

610 “Musk's 2003 Stanford Lecture.”

610 “马斯克的2003年斯坦福大学 演讲。”

611 “Musk, Stanford GSB 2013.”

611 “马斯克，斯坦福商学院 2013。”

612 “Musk's 2003 Stanford Lecture.”

612 “马斯克的2003年斯坦福大学 演讲。”

613 Isaacson, *Elon Musk*.

613 沃尔特·艾萨克森，埃隆 马斯克。

614 Berger, *Liftoff*.

614 伯杰，升空。

615 Anderson, “Elon Musk's Mission to Mars.”

615 安德森，《埃隆·马斯克的火星使命》。

616 Anderson, “Elon Musk's Mission to Mars.”

616 安德森，《埃隆·马斯克的火星使命》

617 Isaacson, *Elon Musk*.

617 艾萨克森，《埃隆 马斯克》

618 “CHM Revolutionaries: An Evening with Elon Musk.”

618 “计算机历史博物馆革新者：与埃隆 马斯克的对话之夜”

619 “Musk's 2003 Stanford Lecture.”

619 “马斯克的2003年斯坦福大学 演讲”

620 “Musk's 2003 Stanford Lecture.”

620 “马斯克的2003年斯坦福大学 演讲”

621 “Elon Musk: Digital Superintelligence,” Y Combinator.

621 “埃隆·马斯克：数字超级智能” Y Combinator

622 “Elon Musk, Charlie Rose Interview (2009).”

622 《埃隆·马斯克，查理·罗斯访谈（2009）》

更多资源 https://mirrorsite.org

623 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

623 可汗与马斯克，《特斯拉汽车公司及 太空探索技术公司首席执行官》

624 Berger, *Liftoff*.

624 伯杰，《升空》

625 Berger, *Liftoff*.

625 伯杰，《升空》。

626 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

626 可汗与马斯克，《特斯拉汽车公司与 太空探索技术公司首席执行官》

627 Berger, *Liftoff*.

627 伯杰，《升空》。

628 “Pando Monthly Fireside Chat.”

628 “潘多月度炉边谈话”

629 Berger, *Liftoff*.

629 伯杰，《升空》。

630 Kimbal, “The Plan Going Forward,” *Kwajalein Atoll and Rockets* (blog), August 3, 2008, http://kwajrockets.blogspot.com/2008/08/plan-going-forward.html.

630 金博尔，“前进计划”，《夸贾林环礁与火箭》（博客），2008年8月3日，http://kwajrockets.blogspot.com/2008/08/plan-going-forward.html。

631 “ISSRDC 2015: A Conversation with Elon Musk,” ISS National Lab, July 8, 2015, YouTube video, 53:03, https://www.youtube.com/watch?v=ZmEg95wPiVU.

631 “ISSRDC 2015：与埃隆·马斯克的对话”，ISS国家实验室，2015年7月8日，YouTube视频，53:03，https://www.youtube.com/watch?v=ZmEg95wPiVU。

632 “SpaceX: Elon Musk's Race to Space,” *60 Minutes*.

632 “太空探索技术公司：埃隆·马斯克的太空竞赛”，60 Minutes。

633 Isaacson, *Elon Musk*.

633 艾萨克森，埃隆 马斯克。

634 “Elon Musk: Digital Superintelligence,” Y Combinator.

634 “埃隆·马斯克：数字超级智能，” Y Combinator。

更多资源 https://mirrorsite.org

635 “Pando Monthly Fireside Chat.”

635 “Pando月度炉边 谈话。”

636 Berger, *Liftoff*.

636 伯杰，《升空》。

637 Berger, *Liftoff*.

637 伯杰，《升空》。

638 Berger, *Liftoff*.

638 伯杰，《升空》。

639 Berger, *Liftoff*.

639 伯杰，《升空》

640 “Future of Energy & Transport,” Oxford Martin School.

640 《能源与交通的未来》，牛津马丁 学院

641 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

641 可汗与马斯克，《特斯拉汽车公司与 太空探索技术公司首席执行官》

642 “Future of Energy & Transport,” Oxford Martin School.

642 《能源与交通的未来》，牛津马丁 学院。

643 Dodd, “Starbase Tour, Part 2.”

643 多德，《星舰基地导览，部件 2》。

644 Dodd, “Starbase Tour, Part 2.”

644 多德，《星舰基地导览，部件 2》。

645 Dodd, “Starbase Tour, Part 2.”

645 多德，《星舰基地导览：部件 2》

646 Isaacson, *Elon Musk*.

646 沃尔特·艾萨克森，《埃隆 马斯克》

647 Dodd, “Starbase Tour, Part 1.”

647 多德，《星舰基地导览：部件 1》

更多资源 https://mirrorsite.org

648 Tim Dodd, “Starbase Tour with Elon Musk [PART 3 // Summer 2021],” Everyday Astronaut, August 11, 2021, YouTube video, 20:51, https://www.youtube.com/watch?v=9Zlnbs-NBUI.

648 蒂姆·多德，《与埃隆·马斯克同游星舰基地[第3部分 // 2021年夏季]》，每日宇航员频道，2021年8月11日，YouTube视频，20:51，https://www.youtube.com/watch?v=9Zlnbs-NBUI。

649 Dodd, “Starbase Tour, Part 2.”

649 多德，《星舰基地导览，第 2部分》。

650 Dodd, “Starbase Tour, Part 2.”

650 多德，《星舰基地导览，第 2部分》。

651 “Elon Musk Delivers SpaceX Update Following Starship Flight 3! Talk Mars, Moon and More,” VideoFromSpace, April 8, 2024, YouTube video, 39:48, https://www.youtube.com/watch?v=7DPR9rzVCzk.

651 “埃隆·马斯克在第三次星舰飞行后发布太空探索技术公司更新！畅谈火星、月球等议题”，VideoFromSpace，2024 年 4 月 8 日，YouTube 视频，39:48，https://www.youtube.com/watch?v=7DPR9rzVCzk。

652 Dodd, “First Look Inside SpaceX's Starfactory.”

652 多德，“首次探访太空探索技术公司 星际工厂内部”。

653 “Elon Musk at TED2022.”

653 “埃隆·马斯克在 TED2022大会”。

654 “Future of Energy & Transport,” Oxford Martin School.

654 《能源与交通的未来》，牛津马丁 学院。

655 Berger, *Liftoff*.

655 伯杰，《升空》。

656 “Elon Musk,” Code Conference 2016.

656 《埃隆·马斯克》，代码大会 2016年。

657 “Musk Mars Pioneer Award Speech.”

657 “马斯克火星先锋奖 演讲”

658 “Elon Musk,” Code Conference 2016.

658 “埃隆·马斯克”，代码大会 2016

659 “Musk Mars Pioneer Award Speech.”

更多资源 https://mirrorsite.org

659 “马斯克火星先锋奖 演讲”

660 Tom Junod, “Elon Musk: Triumph of His Will,” *Esquire*, November 14, 2012, https://www.esquire.com/news-politics/a16681/elon-musk-interview-1212/.

660 汤姆·朱诺德，《埃隆·马斯克： 意志的胜利》，《时尚先生》， 2012年11月14日，https://www.esquire.com/news-politics/a16681/elon-musk-interview-1212/。

661 Dodd, “First Look Inside SpaceX's Starfactory.”

661 多德，《首次探秘太空探索技术公司 星际工厂》。

662 Dodd, “First Look Inside SpaceX's Starfactory.”

662 多德，《首次揭秘太空探索技术公司 星际工厂内部》

663 “Elon Musk: 10X Every 6 Months.”

663 《埃隆·马斯克：每六个月实现十倍增长》

664 “Elon Musk SpaceX Update, Starship Flight 3.”

664 《埃隆·马斯克太空探索技术公司更新：星舰 第三次飞行》

665 Fridman and Musk, “Lex Fridman Podcast #438.”

665 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

666 “Elon Musk SpaceX Update, Starship Flight 3.”

666 《埃隆·马斯克太空探索技术公司更新：星舰飞行 3号》

667 Dodd, “First Look Inside SpaceX's Starfactory.”

667 多德，《首次探秘太空探索技术公司 星际工厂》

668 Dodd, “First Look Inside SpaceX's Starfactory.”

668 多德，《首次探访太空探索技术公司 星际工厂内部》

669 “Elon Musk’s NEW EPIC Rant!,” Matt Pocius on Tesla Stock & Money, June 16, 2024, YouTube video, 42:43, https://www.youtube.com/watch?v=dRZUt6tu8bw.

669 《埃隆·马斯克最新激烈言论！》，马特·波修斯谈特斯拉股票与投资，2024年6月16日，YouTube视频，42:43，https://www.youtube.com/watch?v=dRZUt6tu8bw

670 “Elon Musk,” Code Conference 2016.

670 《埃隆·马斯克》，代码大会 2016上

更多资源 https://mirrorsite.org

671 Peter H. Diamandis and Elon Musk, “Elon Musk on AGI Safety, Superintelligence, and Neuralink (2024) | EP #91,” Peter H. Diamandis, March 25, 2024, YouTube video, 30:27, https://www.youtube.com/watch?v=akXMYvKjUxM.

671 彼得·H·迪亚曼迪斯与埃隆·马斯克，《埃隆·马斯克谈通用人工智能安全、超级智能及神经链接（2024）| EP #91》，彼得·H·迪亚曼迪斯，2024年3月25日，YouTube视频，30分27秒，https://www.youtube.com/watch?v=akXMYvKjUxM。

672 Diamandis and Musk, “AGI Safety, Superintelligence, and Neuralink.”

672 迪亚曼迪斯与马斯克，《通用人工智能安全、超级智能与 神经链接》。

673 Fridman and Musk, “Lex Fridman Podcast #438.”

673 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

674 “Elon Musk SpaceX Update at Starbase,” May 2025.

674 《埃隆·马斯克太空探索技术公司星舰基地进展报告》，2025年5月

675 “Elon Musk SpaceX Update, Starship Flight 3.”

675 《埃隆·马斯克太空探索技术公司进展报告：星舰飞行 3》

676 “Elon Musk's NEW EPIC Rant.”

676 “埃隆·马斯克新史诗级 激烈言论”

677 Dodd, “First Look Inside SpaceX's Starfactory.”

677 多德，《首次探秘太空探索技术公司 星际工厂》

678 Rogan and Musk, “JRE #1609.”

678 罗根与马斯克，《JRE第1609期》

679 Dodd, “Starbase Tour, Part 3.”

679 多德，《星舰基地导览，第 3部分》

680 Dodd, “Starbase Tour, Part 3.”

680 多德，《星舰基地导览，第 3部分》

681 Dodd, “Starbase Tour, Part 3.”

681 多德，《星舰基地导览，第 3部分》

682 “Elon Musk's NEW EPIC Rant.”

682 《埃隆·马斯克全新史诗级 长篇大论》

更多资源 https://mirrorsite.org

683 “Elon Musk SpaceX Update, Starship Flight 3.”

683 “埃隆·马斯克太空探索技术公司更新，星舰飞行 3。”

684 “Elon Musk SpaceX Update, Starship Flight 3.”

684 “埃隆·马斯克太空探索技术公司更新，星舰飞行 3。”

685 Dodd, “Starship-Catching Tower.”

685 多德，“星舰捕捉 塔。”

686 “Musk Mars Pioneer Award Speech.”

686 「马斯克火星先锋奖 演讲」

687 Musk, “Caltech Commencement Speech.”

687 马斯克，「加州理工学院毕业典礼 演讲」

688 Musk, “Caltech Commencement Speech.”

688 马斯克，「加州理工学院毕业典礼 演讲」

689 “Musk Mars Pioneer Award Speech.”

689 “马斯克火星先锋奖 演讲。”

更多资源 https://mirrorsite.org

PART IV

第四部分

更多资源 https://mirrorsite.org

ON BEHALF OF HUMANITY

代表人类

There is something special—far more rewarding than money—about working with an epic team to make breakthroughs.[690]

与一支卓越团队共同实现突破性成就，其带来的满足感远超金钱回报，这是一种独特的体验。[690]

690 Musk (@elonmusk), X account.

690 马斯克 (@elonmusk)，X 账户。

更多资源 https://mirrorsite.org

BUILDING OUR FUTURE

构建我们的未来

I can’t emphasize this enough: As long as we push hard and are not complacent, the future is going to be great.[691]

我无法更加强调：只要我们奋力前行而不自满，未来必将辉煌。[691]

更多资源 https://mirrorsite.org

COMPANIES ARE PHILANTHROPY

企业即慈善

> If you care about the reality of goodness instead of the perception of it, philanthropy is extremely difficult.
>
> 若你关注善的本质而非其表象，慈善实则极为艰难。
>
> If philanthropy is acting from a love of humanity—my companies are philanthropy.[692]
>
> 倘若慈善源于对人类的热爱——我的企业便是慈善。[692]

Q: What do you say to people who criticize you for not "having your name on a hospital wing" or making other nonprofit donations?

问：对于批评您未'在医院翼楼冠名'或进行其他非营利捐赠的人士，您作何回应？

I do have a small foundation. I am giving some money away. But generally, if there's a way to fix something within the market system, building a company is the better way to do it. Sometimes there isn't or there are complications to it.[693]

我确实设有一个小型基金会。我正逐步捐出部分资产。但总体而言，若能在市场体系内解决问题，创立企业实为更优途径。有时此法不可行，或存在复杂因素。[693]

更多资源 https://mirrorsite.org

If it’s possible to solve a problem with a profitable venture then that’s the best thing to do. In the grand scheme of things, there are a few failures in the market that have to be addressed with a nonprofit. There are some, but not many.[694]

若能通过营利性事业解决问题，那是最佳方案。整体来看，市场体系中需通过非营利组织弥补的缺陷为数不多。有一些，但不多。[694]

SpaceX, Tesla, Neuralink, and the Boring Company are philanthropy. SpaceX is trying to ensure the long-term survival of humanity as a multiple-planet species. We also provide global internet through Starlink. That is love of humanity. Tesla is accelerating sustainable energy. This is a love-based mission. Neuralink is trying to help solve brain injuries and the existential risk of AI. That is love of humanity. The Boring Company is trying to save people’s time by solving traffic, which is hell for most people. That is also love of humanity.[695]

太空探索技术公司、特斯拉、Neuralink和隧道挖掘公司都是慈善事业。太空探索技术公司致力于确保人类作为跨行星物种的长期生存。我们还通过星链提供全球互联网服务，这就是对人类的大爱。特斯拉正在加速可持续能源的发展。这是一项基于爱的使命。Neuralink致力于解决脑损伤和人工智能的生存风险，这就是对人类的大爱。隧道挖掘公司通过解决交通拥堵（这对大多数人而言苦不堪言）来节省人们的时间。这也是对人类的大爱。[695]

My fundamental intent is to improve the probability of the future being good. SpaceX and Tesla will do more good for humanity than anything I could do with philanthropy. It is difficult to give away money effectively if you care about the money actually doing good, not merely having the perception of doing good.[696]

我的根本目标是提高未来向好发展的概率。太空探索技术公司与特斯拉为人类创造的福祉，将远超我从事慈善所能达成的任何成就。若你真正关切资金是否切实创造价值，而非仅追求善举的表象，高效捐赠便绝非易事。[696]

更多资源 https://mirrorsite.org

Tesla sells twice as many electric vehicles as the rest of electric car makers in the United States combined. Tesla has done more to help the environment than all other companies combined. Therefore, it would be fair to say as a leader of that company I've done more for the environment than any other single human on Earth. I care about the reality of goodness, not the perception of it.

特斯拉在美国的电动载具销量，超过其他所有电动载具制造商销量的总和。特斯拉为环境保护作出的实质贡献，超越了所有其他企业的总和。因此公允而言，作为企业领导者，我对地球环境的贡献超越任何个人。我关注善举的实质价值，而非表象光环。

What I see all over the place is people who care about looking good while doing evil. Fuck them.[697]

我目睹无数人一边作恶一边粉饰形象。去他们的！[697]

> I care about reality. Perception be damned.[698]
>
> 我专注现实。让虚名见鬼去吧。[698]

更多资源 https://mirrorsite.org

COMPANIES CREATE WEALTH FOR ALL

企业为全民创造财富

I don’t disrupt something for the sake of disrupting it. My focus is making a product that improves quality of life for people.[699]

我从不为了颠覆而颠覆。我的核心是创造提升人类生活质量的产品。[699]

If the output is more valuable than the inputs, that creates a profit. Profit shows you have a useful company. But in a high-growth scenario, you need a lot more inputs for *future* output, so for a while you have negative cash flow and lack of profitability, which we had early on at Tesla. In the long term, of course, that has to be fixed. There can’t be a negative cash flow in the long term.[700]

当产出价值高于投入成本时，利润便自然产生。盈利表明你拥有具备价值的公司。但在高增长情境下，需为未来产出投入大量资源，因此短期内会产生负现金流且难以盈利——特斯拉早期正是如此。但从长远看，这种状况必须扭转。长期维持负现金流不可持续。[700]

If you create a company that produces products and services better than what existed before, wealth is created. If you have some ownership in that company, wealth accrues to you. Doing good work gives you the right to allocate more capital.[701]

若创建的公司能提供优于现存水平的产品与服务，财富便由此产生。若持有该公司股权，财富自会流向你。卓越的工作成效赋予你更大的资本配置权。[701]

Sometimes people equate wealth with consumption, but they’re obviously not the same thing. Consumption is fun, but capital allocation is a job.

更多资源 https://mirrorsite.org

有人将财富等同于消费能力，但二者显然不可等同。消费固然愉悦，资本配置却是专业职责。

> If people want to get upset about something, excess consumption is more reasonable than being upset about someone having a high net worth.[702]
>
> 若需质疑，过度消费比因他人净资产高企而愤懑更为合理。[702]

Warren Buffett has a high net worth because he's doing a useful job allocating capital for the economy. He's very skilled at it, and he should probably keep doing it. But he is not engaged in insane, conspicuous consumption.[703]

沃伦·巴菲特拥有高净资产，源于他在为经济配置资本方面从事着有价值的工作。他精于此道，理应继续深耕。但他从不涉足疯狂而招摇的消费。[703]

Warren Buffett sits there and reads all these super boring annual reports. Does anybody want that job? He is constantly reading tedious annual reports of companies, including the minutiae of accounting and deciding whether to allocate capital into Coke or Pepsi. I don't want that job.[704]

沃伦·巴菲特终日研读那些极其枯燥的年度报告。这份差事可有人愿接手？他持续审阅公司冗长的年报，细究会计细节，决策资本该注入可口可乐还是百事可乐。这等差事我敬谢不敏。[704]

I'm not claiming I have no money. But when people hear a big number for my net worth, they think I have that much cash, and I'm sitting on the cash doing nothing, hoarding resources. No, that value *is* the stock of these companies. Net worth just calculates my ownership of these companies, if you add them up. It's not as though I've got billions of dollars sitting in a bank account.[705]

更多资源 https://mirrorsite.org

我并非宣称身无分文。但当人们听闻我巨额净资产时，总以为我坐拥等值现金，囤积资源却无所作为。实则不然，这些价值正是公司股票。净资产仅核算我对这些企业的持股总和，绝非意味着银行账户里躺着数十亿现金。[705]

> Just as my money was the first into Tesla, it will be the last out.[706]
>
> 正如我的资金是投入特斯拉的首笔资本，它也必将是最后撤离的资金。[706]

The alternative to keeping the stock would be to say, “Okay, let’s give the stock to the government or someone else.” Then the government would control the companies and be running things.[707]

放弃股权的替代方案无异于宣称'好吧，将股权移交政府或其他方'。届时政府将掌控企业并主导运营。[707]

A lot of the push for higher government involvement or expropriation of assets to the government is from politicians. What they are saying is those resources shouldn’t be in control of individuals who built them, but instead should be under government control. They’re basically saying they want control of the assets.[708]

推动政府加强干预或实施资产征用的诸多主张皆源自政客。其核心论点是：这些资源不应由创建者掌控，而应置于政府管制之下。说白了，他们就是要攫取资产控制权。[708]

I think the profit motive is good if the rules of an industry are properly set up. There’s nothing wrong with profit. Profit just means people are paying you more for whatever you’re creating than you’re spending to create it. That’s a good thing. If that’s not the case, you’ll soon be out of business, and rightfully so, because you’re not adding enough value.[709]

更多资源 https://mirrorsite.org

我认为只要行业规则设置得当，盈利动机就具有积极意义。追求利润本身无可指摘。盈利本质在于：市场为产品支付的溢价高于生产成本。这是价值创造的良性循环。若非如此，企业必将迅速消亡——这理所当然，因为你未能创造足够价值。[709]

A few people do bad things to achieve profit, but that's quite unusual, because the rules are mostly set up correctly. Not perfect, but mostly correct.[710]

确有极少数人为牟利铤而走险，但这属例外情况，毕竟行业规则体系总体健全。并不完美，但大体正确。[710]

It is insanely hard to build and ship useful products to a large number of people. There's a hell of a difference between a company that has shipped a product and one that hasn't. It's night and day. Once you ship products, is the value of the output worth more than the cost of the inputs? Again insanely difficult, especially with hardware.[711]

向大规模人群构建并交付实用产品是极为困难的。已交付产品的公司与未交付者存在天壤之别。关键在于：产出价值是否高于投入成本？这同样极为困难，尤其在硬件领域。[711]

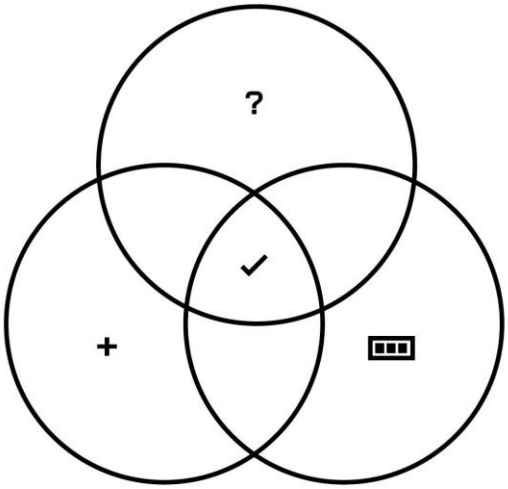
If you create great products and services that create wealth, that should be applauded.

若创造能产生财富的优秀产品与服务，理应获得赞许。

You increased the standard of living of the country and perhaps of the world.

你提升了国家乃至全球的生活水平。

更多资源 https://mirrorsite.org



投身于你感兴趣、能获得成就感，且能为社会创造价值的事业。

更多资源 https://mirrorsite.org

COMPANIES TO START

可创立的公司

> Work on things that you find interesting, fulfilling, and that contribute some good to the rest of society.[712]
>
> 投身于感兴趣且富有成就感的事业，并为社会创造积极价值。[712]

Q: What are some areas you see where people could build important new technology?

提问：您认为哪些领域适合构建重要新技术？

For five years people asked me where I saw opportunities and I'd say "tunneling." But nobody did anything. It was initially a joke, but we created the Boring Company and did a test tunnel in LA. People still didn't believe us. Then we did our first operational tunnel in Vegas.[713]

五年来人们询问商机所在，我始终回答'隧道工程'，但无人付诸行动。起初这仅是个玩笑，但我们创立隧道挖掘公司并在洛杉矶建造试验隧道。直至拉斯维加斯首条运营隧道建成，质疑声仍未平息。[713]

There are still tremendous opportunities in tunneling. The world needs tunnels. All major cities have traffic, and tunnels can massively improve people's quality of life by making it easy to travel from one place to another. They can be further expanded to long-distance travel. If you draw a vacuum on the tunnel, you can go extremely fast. Faster than a plane or high-speed rail. I'd still recommend someone—please—start a tunneling company.[714]

更多资源 https://mirrorsite.org

隧道建设领域仍蕴藏着巨大机遇。世界需要隧道。所有大城市都面临交通拥堵，隧道能让人轻松穿梭各地，从而极大改善生活质量。其应用范围可进一步扩展至long-distance旅行领域。若在隧道内制造真空环境，即可实现超高速通行。速度超越飞机或high-speed高铁。我仍要呼吁——请有人创立隧道公司。[714]

Another company to start would be anything to do with genetics. If you can solve genetic diseases, you can prevent dementia or Alzheimer's with genetic reprogramming. That would be wonderful.[715]

另一值得开拓的领域是遗传学相关产业。若能攻克遗传性疾病，通过基因重组预防痴呆症或阿尔茨海默病，那将是重大突破。[715]

> Synthetic RNA is revolutionary in medicine. Most people are not aware just how much of a revolution this is.
>
> 合成RNA技术正引发医药革命。多数人尚未意识到这场革命的颠覆程度。
>
> This is like medicine going from analog to digital.[716]
>
> 这如同药物从模拟时代迈入数字时代。[716]

RNA (ribonucleic acid) or MRNA (messenger RNA) are basically synthetic viruses. I think people don't appreciate what's going on—this is the digitization of medicine. You can create an RNA or DNA (deoxyribonucleic acid) sequence like a computer program and encapsulate it in a lipid shell, so it looks like a tasty treat for your cells. This is the future of medicine.[717]

RNA（核糖核酸）或mRNA（信使RNA）本质上是合成病毒。我认为人们尚未充分意识到正在发生的变革——这是医学的数字化进程。你

更多资源 https://mirrorsite.org

可以像编写计算机程序般创建RNA或DNA（脱氧核糖核酸）序列，并用脂质外壳封装，使其成为细胞的美味诱饵。这就是医学的未来方向。[717]

You can do almost anything. You could probably figure out how to turn someone into a literal butterfly. Your cells are tiny biological computers. They execute just like old-school computers, where you feed it a tape or punch card. Your cells do whatever their punch card says. That was a big eye-opener, understanding the potential of RNA.[718]

几乎任何可能性都能实现。你甚至可能破解将人类转化为蝴蝶的技术路径。人类细胞实则是微型生物计算机。其运行机制如同老式计算机，通过读取磁带或穿孔卡片执行指令。细胞会严格遵循穿孔卡片编码的指令行动。认识到RNA的潜力堪称重大认知突破。[718]

You could start a company for high-speed travel. Reading about the California high-speed rail was depressing. California taxpayers are paying to build the most expensive high-speed rail per mile in the world—and the slowest. Those are not the superlatives you want.[719]

你可以创办一家专注于高速交通的公司。读到关于加利福尼亚州高速铁路的报道令人沮丧。加利福尼亚州纳税人正在为全球每英里造价最高——同时也是最慢的高速铁路买单。这些可不是我们想要的'世界之最'。[719]

It’s California! We make super high-tech stuff! Why are we spending—the estimates are around $100 billion—for something that will take two hours to go from LA to San Francisco? You can get on a plane and do that in forty-five minutes.[720]

这可是加利福尼亚州！我们制造尖端高科技产品！为何要耗资约1000亿美元——建造这个从洛杉矶到旧金山需要两小时的项目？你完全可以搭乘飞机，四十五分钟就能抵达。[720]

更多资源 https://mirrorsite.org

There has to be a better way to do this. What would you ideally want in a transportation system? You want something faster than existing modes of transportation. Let's say twice as fast, costs half as much per ticket, can't crash, is immune to weather, and is not energy intensive. You can self-power the whole thing with solar panels or something. That would be pretty good. The devil is in the details of making the thing work, but something like this could work and be practical.[721]

必须找到更优解决方案。理想化的运输系统应具备哪些核心要素？你需要超越现有交通模式的更高速方案。例如速度翻倍、票价减半、杜绝碰撞、不受气候制约且低能耗。可通过太阳能电池板等设备实现全程自供电。这将极具价值。关键在于实施细节的精准把控，但此类方案兼具可行性与实用性。[721]

There's the possibility of this fifth mode of transport; I call it the Hyperloop.[722]

第五种交通方式成为可能，我将其命名为超级高铁。[722]

For long-distance travel, you can do tunnels or tubes. If you remove the air or most of the air, you can get rid of the air friction and go supersonic. You can do so with no dependence on weather and no need to get to high altitude or create any sonic boom issues. That's what I envision for the Hyperloop. It's basically a pressurized electric car in a vacuum tube. This will be our next evolution in transport.[723]

长途运输可采用隧道或管道系统。通过抽离全部或大部分空气消除摩擦阻力，即可实现超音速行驶。这完全无需依赖天气条件，也无需达到高空或引发音爆问题。这就是我对超级高铁的构想：本质上就是真空管道内的加压电动汽车。这将开启交通运输的下一轮进化。[723]

We want the future to be better than the past. If we had something like the Hyperloop, you'd look forward to the day that was working. Even if it was only in one place—from LA to San Francisco, or New York to DC—it would be a tourist attraction and show it is possible.[724]

更多资源 https://mirrorsite.org

我们期望未来能超越过去。若拥有超级高铁这样的技术，你会期盼它投入运营的那天。即使仅开通单条线路——如洛杉矶至旧金山或纽约至华盛顿——它也将成为旅游景点，证明这种技术的可行性。[724]

Even if some of the initial assumptions didn't work out or the economics didn't work out quite as expected, it would still be cool. If you come up with a new technology, it should feel like that. If you told a stranger, would they look forward to the day this new thing became available?[725]

即便某些初始假设不成立或经济效益未达预期，它依然令人振奋。真正的新技术就该给人这种感觉。若向陌生人描述这项创新，他们是否会期待它问世之日？[725]

Q: What is the most important piece of advice you have for anyone who wants to start a company on behalf of humanity?

问：对于有志代表人类创立公司者，您最重要的建议是什么？

The final thing I would encourage you to do is to take risks. Especially before you have kids and other obligations. As you get older, your obligations start to increase. Once you have a family, taking risks affects not just yourself, but your family as well. It gets harder to do things that might not work out. It is easiest to start before you have those obligations. Take risks now, and do something bold. You won't regret it.[726]

我最后要鼓励你们的就是勇于冒险。尤其是在你们尚未承担养育子女及其他责任之前。随着年龄增长，你们承担的责任会日益加重。一旦组建家庭，冒险行为影响的不仅是你们自身，更将波及整个家庭。此时尝试可能失败的事情将更为困难。在承担责任前行动才是最佳时机。现在就勇敢冒险，采取大胆行动。你们绝不会为此后悔。[726]

> Go do it. Just go out there and do it. People are far too afraid to try. Fear is the biggest reason for failure. Don't be afraid to fail. Just go.[727]

更多资源 https://mirrorsite.org

放手去做。立即付诸实践。人们往往因过度畏惧而不敢尝试。恐惧正是失败的首要原因。不要畏惧失败。即刻行动。[727]

If you don’t push for radical breakthroughs, you’re not going to get radical outcomes.[728]

若不追求重大突破，便无法取得颠覆性成果。[728]

更多资源 https://mirrorsite.org

COMPANIES DRIVE PROGRESS

企业驱动进步

> The rate of innovation is not constant. This year, we're either going to increase the rate of innovation or it will slow down.[729]
>
> 创新速率并非恒定不变。今年我们要么提升创新速度，要么将面临增速放缓。[729]

Some people think technology automatically gets better every year. It does not. It only gets better if smart people work like crazy to make it better. We need strong engineering talent applied to problems. That's how any technology actually gets better. If people don't *work* on technology, it actually will decline.[730]

有人认为技术每年都会自动进步。事实并非如此。唯有智者全力以赴地推动改进，技术方能取得突破。我们需要顶尖的工程人才来解决实际问题。这正是技术实现实质性进步的唯一途径。若人类停止投入技术研发，技术必将衰退。[730]

Look at the history of civilizations and you'll see this happen many times. Ancient Egypt was able to build incredible pyramids and forgot how to build pyramids. Then they forgot how to read hieroglyphics. In Rome, they were able to build incredible roadways, aqueducts, and indoor plumbing—they forgot how to do all those things. There are many examples in history. You should always bear in mind that entropy is not on our side.[731]

更多资源 https://mirrorsite.org

纵观文明发展史，此类现象反复上演。古埃及人曾能建造恢弘的金字塔，最终却遗失了建造技艺。继而连解读象形文字的能力也消逝殆尽。罗马帝国精通建造卓越的道路、水渠及室内管道系统——最终这些技术全部失传。历史上此类案例不胜枚举。须时刻铭记：熵增定律永不为人类助力。[731]

More recently, if you look at American manned space missions: We were able to go to the moon in 1969, then the space shuttle could only go to low earth orbit. Then the space shuttle retired and for almost a decade America had no access to space for humans.

近期案例可见美国载人航天：1969年实现登月壮举，后续航天飞机却仅能抵达近地轨道。航天飞机退役后，美国载人航天能力中断近十年之久。

This is a pretty bad trend, trending to zero. We need a strong trend in the other direction to have any chance whatsoever of making life multiplanetary. That’s the reason for the extreme sense of urgency. If we operate with extreme urgency, we have a chance of making life multiplanetary. Still just a chance; it’s not certain. If we don’t act with extreme urgency, that chance is probably zero.

这种持续恶化的趋势，终将导致能力归零。我们必须形成强劲的反向趋势，才有一线可能实现生命的多行星化。这就是极端紧迫感的根源所在。若以极端紧迫感行事，我们尚有机会实现生命的多行星化。但这仍只是可能，而非必然。若无极端紧迫感，这个机会必将归零。

I am not one of the doomsday people. I think we’re on a good path. But at the same time, I want to caution against complacency. If we are not complacent, and we have a high sense of urgency, things will be fine.[732]

我并非末日论者。我认为当前发展态势良好。但与此同时，我须告诫：切莫自满。只要保持警醒并高度紧迫，前景必将向好。[732]

更多资源 https://mirrorsite.org

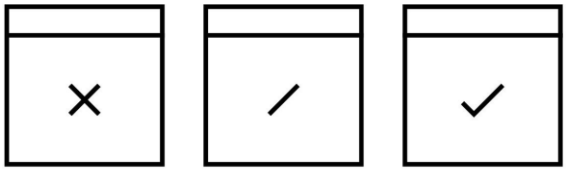
If you want the future to be good, you must make it so.

欲得美好未来，必当亲手缔造。

Take action to make it good, and it will be.[733]

付诸行动以塑其善，则善境自成。[733]

更多资源 https://mirrorsite.org



若期冀美好未来，
就必须亲手缔造。

691 Anderson and Musk, “A Future Worth Getting Excited About.”

691 安德森与马斯克，《值得期待的未来》

692 “Elon Musk at TED2022.”

692 “埃隆·马斯克在TED2022大会。”

693 “Jeff Skoll Talks with Elon and Kimbal Musk.”

693 “杰夫·斯科尔与埃隆及坎巴尔·马斯克对话。”

694 “Jeff Skoll Talks with Elon and Kimbal Musk.”

更多资源 https://mirrorsite.org

694 “杰夫·斯科尔与埃隆及坎巴尔·马斯克对话。”

695 “Elon Musk at TED2022.”

695 “埃隆·马斯克在 TED2022大会”

696 “Birthrate Threat,” WELT Documentary.

696 “生育率危机”，《世界报》 纪录片

697 “Elon Musk on Advertisers,” DealBook Summit 2023.

697 “埃隆·马斯克谈广告商”，交易书峰会 2023

698 “Birthrate Threat,” WELT Documentary.

698 《生育率危机》，《世界报》 纪录片

699 Musk, “Interview with David Faber,” X Spaces.

699 马斯克《与大卫·法伯的访谈》，X 空间平台

700 “Elon Musk's Vision for the Future.”

700 《埃隆·马斯克的 未来愿景》

701 Rogan and Musk, “JRE #1470.”

701 罗根与马斯克，《JRE第1470期》

702 “TIME Person of the Year: Elon Musk.”

702 《《时代》周刊年度人物：埃隆·马斯克》

703 “TIME Person of the Year: Elon Musk.”

703 《《时代》周刊年度人物：埃隆·马斯克》

704 Dodd, “Starship-Catching Tower.”

704 多德，《星舰捕捉塔》

705 Wilson and Musk, “Metaphysical Van.”

705 威尔逊与马斯克，《形而上学 范》。

706 Musk (@elonmusk), X account.

706 马斯克 (@elonmusk)，X 账户。

707 “Third Row Tesla Podcast, Episode 7.”

更多资源 https://mirrorsite.org

707 《特斯拉第三排播客第 7集》。

708 “TIME Person of the Year: Elon Musk.”

708 “《时代》周刊年度人物：埃隆 马斯克”

709 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

709 可汗与马斯克，“特斯拉汽车公司与 太空探索技术公司首席执行官”

710 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

710 可汗与马斯克，“特斯拉汽车公司与 太空探索技术公司首席执行官”

711 “Tesla AI Day 2022.”

711 “特斯拉AI日 2022。”

712 Musk, “Interview with David Faber,” X Spaces.

712 马斯克，“大卫·法伯专访”，X 空间。

713 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

713 克里希南与拉玛穆尔蒂，“埃隆·马斯克俱乐部会所 专访。”

714 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

714 克里希南和拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》

715 “Elon Musk's Vision for the Future.”

715 《埃隆·马斯克对 未来的愿景》

716 “Birthrate Threat,” WELT Documentary.

716 《生育率危机》，《世界报》 纪录片

717 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

717 克里希南和拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》

718 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

718 克里希南和拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》

719 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

719 可汗和马斯克，《特斯拉汽车首席执行官和 太空探索技术公司》

720 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

更多资源 https://mirrorsite.org

720 可汗与马斯克，《特斯拉汽车首席执行官与太空探索技术公司》

721 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

721 可汗与马斯克，《特斯拉汽车首席执行官与太空探索技术公司》

722 “Future of Energy & Transport,” Oxford Martin School.

722 《能源与交通的未来》，牛津马丁学院

723 “Elon Musk on Tesla, SpaceX,” *WSJ*.

723 “埃隆·马斯克谈特斯拉与太空探索技术公司，”《华尔街日报》。

724 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

724 可汗与马斯克，“特斯拉汽车公司与 太空探索技术公司首席执行官。”

725 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

725 可汗与马斯克，“特斯拉汽车公司与 太空探索技术公司首席执行官。”

726 “Musk USC Commencement Speech.”

726 「马斯克南加州大学毕业 演讲」

727 “Musk USC Commencement Speech.”

727 「马斯克南加州大学毕业 演讲」

728 “Elon Musk, Air Warfare Symposium 2020.”

728 「埃隆·马斯克，2020年空中作战研讨会 」

729 Dodd, “Starbase Tour, Part 3.”

729 多德，《星舰基地导览，部件 3》。

730 “Elon Musk on How to Build the Future.”

730 《埃隆·马斯克谈如何建造 未来》。

731 “Elon Musk on How to Build the Future.”

731 《埃隆·马斯克谈如何建造 未来》。

732 Anderson and Musk, “A Future Worth Getting Excited About.”

732 安德森与马斯克，《一个值得期待的未 来》。

733 Anderson and Musk, “A Future Worth Getting Excited About.”

更多资源 https://mirrorsite.org

733 安德森与马斯克，《一个值得期待的未 来》。

更多资源 https://mirrorsite.org

THE AGE OF ABUNDANCE

富足时代

AI and robotics will bring about what might be termed “the age of abundance.”

人工智能与机器人技术将开启所谓的'富足时代'。

Other people have used this word, and that is my prediction: It will be an age of abundance for everyone.[734]

其他人也使用过这个词，而我的预测是：这将是一个全民富足的时代。[734]

更多资源 https://mirrorsite.org

THE END OF SCARCITY

稀缺终结

People get confused sometimes; they think an economy is money. Money is just a database.

人们有时会感到困惑，他们认为经济就是金钱。金钱只是一个数据库。

The actual economy is stuff. Goods and services. What limits the output of goods and services? The limiter is labor. Even capital is distilled labor, so the limiting factor for the economy is labor.[735]

真正的经济是实物——商品与服务。是什么限制了商品与服务的产出？限制因素在于劳动力。即使资本也是劳动的浓缩体现，因此经济的核心制约因素就是劳动力。[735]

We can massively increase labor by building humanoid robots. If you remove labor as the limiting factor for the economy, it’s not clear that an economy in the traditional sense has any meaning anymore because you have no constraint on goods and services. There will be no shortage of goods and services.[736]

通过建造人形机器人，我们可以大幅扩充劳动力规模。若劳动力不再是经济的制约因素，传统意义上的经济概念将失去意义，因为商品与服务将不再受限。商品与服务将永不枯竭。[736]

The first units we intend to make are for jobs that are dangerous, boring, repetitive things that people don’t want to do.[737]

我们计划首批制造的人形机器人，将用于人类不愿从事的危险、枯燥、重复性工作岗位。[737]

更多资源 https://mirrorsite.org

In the future, the only forms of scarcity will be artificial scarcity (where we decide to make it scarce, like a particular piece of art) or unique items like a particular home in an exact location.[738]

未来唯一的稀缺形式，将是人为制造的稀缺（如特定艺术品），或地理位置独特的物品（如特定地段的住宅）。[738]

Don’t worry about robots putting people out of jobs. We already have a massive shortage of labor. We will still have a shortage of labor even in the future. Robotics will create a world of abundance—goods and services will be available to anyone who wants them, so cheap it’ll be ridiculous.[739]

不必担忧机器人会导致人类失业。我们已经面临严重的劳动力短缺问题。即使在将来，劳动力短缺问题依然会存在。机器人技术将创造富足世界——商品与服务将向所有需求者开放，价格将便宜到离谱。[739]

Our goal at Tesla is to make a useful humanoid robot as quickly as possible. Eventually, there will be millions of them. This means a future of abundance, a future where there is no poverty. We can afford to have a universal basic income for people. It really is a fundamental transformation of civilization.[740]

特斯拉的目标是尽快制造出实用的人形机器人。最终这类机器人的数量将达到数百万台。这意味着一个富足的未来，一个没有贫困的未来。我们将有能力为民众提供全民基本收入。这确实是一场根本性的文明变革；[740]

> People have no idea; the market for humanoid robots will be bigger than that of cars.[741]
>
> 人们尚未意识到人形机器人市场的规模将超越汽车市场。[741]

更多资源 https://mirrorsite.org

There will be humanoid robots throughout factories. Cars will also be entirely automatic. Anywhere intelligence can be applied will be automated. That's maybe 2033–2043.[742]

工厂将遍布人形机器人的身影。汽车也将实现完全自动化驾驶。凡是智能可应用的领域都将实现自动化，时间窗口可能在2033-2043年。[742]

As we go further into the future, things are gonna change a lot. Everything will be automatic. There will be household robots that you can talk to as if they are people. It will help you, be a companion, or whatever the case may be. It will be able to pick up your kids from school or stay with them at school if you want. It will be able to teach kids anything and support any language.

随着时间推移，一切都将发生巨变。所有事物都将自动化运作。家用机器人将普及，你可以如同与人交谈般同它们对话。它将协助你、作为伴侣，或承担其他角色。既能接送孩子上下学，也可根据需求在校陪伴。它能教授孩子任何学科知识，并支持全语种教学。

Long term, I think the ratio of humanoid robots will be more than one-to-one. There might be two humanoid robots per person or more, maybe ten for every one. Well in excess of ten billion humanoid robots. At volume production, a humanoid robot will cost less than a car.[743]

长期而言，人形机器人的比例将远超一比一。 未来人均可能配备两具或更多人形机器人，甚至可达十具。总量将突破百亿规模。量产后，人形机器人成本将低于汽车。[743]

更多资源 https://mirrorsite.org

EXPONENTIAL INTELLIGENCE

指数级智能

Computing power is going to be crazy. The big change is the cost of computing power, not so much the circuit density (known as Moore's Law). If you look at dollars per instruction, cost is dropping exponentially.

计算能力将呈指数级跃升。关键变革在于计算成本（非电路密度的摩尔定律）。从单指令成本看，其下降曲线呈指数态势。

We'll see massively parallel computers, computing power, and storage become extremely available. There will be ubiquitous computing everywhere.[744]

我们将见证大规模并行计算机、计算能力和存储变得极其普及。无处不在的计算将遍布每个角落。[744]

I expect AI to be incredibly sophisticated by the 2040s. Predicting trends in an exponential curve is tricky, because up close it often looks linear. But actually, it's not linear. The pace of AI development itself appears to be accelerating.[745]

我预计到2040年代，人工智能将变得异常精密。预测指数曲线趋势很棘手，因为近距离观察时它常呈线性状态。但实际上，它并非线性发展。人工智能本身的发展速度似乎正在加快。[745]

The ratio of total digital compute to total biological compute is the key metric to watch. This is perhaps the most fundamental ratio defining technological progress. It is rising incredibly fast.[746]

数字计算总量与生物计算总量之比是值得关注的关键指标。这或许是定义技术进步最根本的比例关系。该比例正以惊人速度攀升。[746]

更多资源 https://mirrorsite.org

We're building progressively greater intelligences, *and* the percentage of nonhuman intelligence is increasing. Eventually we humans will represent a small percentage of total intelligence. It might feel like we're the biological bootloader for AI.[747]

我们正在构建日益增强的智能，且非人类智能的占比持续上升。终有一天，人类在智能总量中的占比将变得微不足道。这感觉就像我们是人工智能的生物引导加载器。[747]

We're fairly close to artificial general intelligence, perhaps only a few years away. It's possible we are on the event horizon of the black hole that is artificial superintelligence. Over a twenty- to thirty-year time frame, things could be transformed beyond belief. We probably won't recognize society in thirty years.[748]

我们已相当接近通用人工智能，可能只需几年时间。我们可能正处于人工超级智能这个黑洞的事件视界上。在二十到三十年的时间跨度内，世界将发生超乎想象的变革。三十年后，我们可能将认不出这个社会。[748]

更多资源 https://mirrorsite.org

互联网是信息与教育的伟大均衡器

线上可免费学习任何知识

更多资源 https://mirrorsite.org

UPGRADING THE HUMAN MIND

人类思维的升级

> The internet is a great leveler for information and education. You can learn anything online for free.[749]
>
> 互联网是信息和教育的伟大平衡器。你可以在线免费学习任何知识。[749]

A thousand years ago there were very few books.[750] Even if you had a thirst for knowledge you couldn't do much about it, because books were incredibly expensive and rare, and only a few people knew how to read. Books were difficult to get until the Gutenberg Press. Technology is what causes these big step-changes in civilization.[751]

A thousand years ago there were very few books. | 千年前，书籍极其稀少。[750] 即便你求知若渴，也难有作为——书籍不仅价比天高且存世稀少，识字者更是凤毛麟角。在古腾堡印刷术问世前，书籍获取困难。技术正是推动文明阶梯式跃进的核心动力。[751]

Even if you could read and were in the Library of Congress, you still didn't have access to all the world's information, and you certainly couldn't search it. And, of course, very few people could be in the Library of Congress at once.[752]

纵使你识文断字且身处国会图书馆，仍无法触及全球知识宝库，遑论精准检索。更何况，能同时进入国会图书馆者本就屈指可数。[752]

更多资源 https://mirrorsite.org

The internet is something beyond the Gutenberg press. When the general public started using the internet, it felt like humanity was developing a nervous system. Any part of humanity got access to almost all human knowledge. You could be deep in the Amazon jungle with a Starlink terminal and have access to more information than the US president did in 1980.[753]

互联网是超越古腾堡印刷术的存在。当大众开始使用互联网时，仿佛人类正在形成神经系统。任何角落的人类都能获取几乎所有人类知识。身处亚马逊雨林深处，只要有星链终端，你获取的信息量就能超越1980年的美国总统。[753]

To transfer data before the digital age, you had to write a letter. Someone would have to carry the letter to another person with a bunch of physical work in between. That's insanely slow when you think about it. Now, you can access any book instantly; you can learn anything. It's incredible.[754]

数字时代之前传输数据必须依赖书信。需要专人传递信件，期间涉及大量体力劳动。细想之下效率极低。如今可即时获取任何书籍，学习万物，简直不可思议。[754]

> Any student of history would agree: The internet has been the biggest equalizer in history for access to information and knowledge.[755]
>
> 任何历史学者都会认同：互联网已成为信息知识平权史上最伟大的均衡器。[755]

We already have a digital layer to our minds, in a sense, with our computer or our phone. You can access any book or song. You can ask a question on Google and get an answer instantly. With your laptop, you can outcompute an Empire State Building filled with people and calculators. These are

更多资源 https://mirrorsite.org

incredible superpowers, which even the president of the United States didn't have back in the year 2000.[756]

在某种意义上，我们已通过电脑或手机为思维构建了数字层。可获取任何书籍或歌曲。在谷歌提问即可瞬间获得答案。凭借一台笔记本电脑，你的算力就能超越整座帝国大厦里所有人类和计算器的总和。这些都是难以置信的超能力，即便在2000年，时任美国总统也不曾拥有。[756]

People don't appreciate this yet—they are already a cyborg. You're a different creature than you would have been twenty years ago, or even ten years ago.

人们尚未意识到这点——他们其实已经算是赛博格了。相比二十年前甚至十年前，如今的你已蜕变为全然不同的存在。

They do surveys asking, "How long can you be away from your phone?" Particularly for younger people, even a day is painful. If you leave your phone behind, it's like missing a limb. People have already merged with their phones.[757]

调查显示：'你能离开手机多久？'对年轻人而言，哪怕一天都难以忍受。若忘带手机，宛如肢体残缺般不适。人类已与手机深度融合。[757]

You're already digitally superhuman.[758]

在数字领域，你已然成为超人。[758]

Q: Will the brain–computer interface change humans and how we use computers?

问：脑机接口是否会改变人类及计算机使用方式？

更多资源 https://mirrorsite.org

Yes, an intertwined idea is having a higher-bandwidth interface between computers and the brain. We're currently bandwidth limited. The connection is bottlenecked in this tiny straw of an interface, poking glass with your meat sticks.[759]

确实，关键构想在于建立人脑与计算机间的高带宽交互界面。我们当前正受限于带宽瓶颈。连接性能被这个细如吸管的接口所限制，只能用肉指戳玻璃屏操作。[759]

Ten-finger typing on a keyboard used to be the most common input to a computer. Now, it's usually two-thumb typing. Our output quality has gone backward.

十指键盘打字曾是计算机最常见的输入方式。如今通常变成双指拇指操作。我们的输出效率反而下滑了。

The sustained output of a human over the course of a day is less than one bit per second. There are 86,400 seconds in a day. It is extremely rare for a human to output more than that number of symbols per day, certainly for several days in a row. We should be able to improve that by many orders of magnitude with a direct neural interface—a high-bandwidth interface to your digital enhancements.[760]

人类全天持续输出的信息量每秒不足1比特。每日有86,400秒。人类单日输出符号量极少能超过这个数值，连续多日更不可能。通过神经直连接口——即连接数字增强设备的高带宽通道，我们应当能将效率提升数个数量级。[760]

Noland Arbaugh was the very first Neuralink patient. After he got the Neuralink implant, he spent all night playing *Civilization*, which is awesome. That's exactly what I'd do too. Even with only roughly 10 to 15 percent of the electrodes working, we were able to achieve a bit per second. That was twice the previous world record. Maybe five years from now, we might be at a megabit—faster than any human could possibly communicate by typing or speaking.[761]

更多资源 https://mirrorsite.org

诺兰·阿博是首位植入Neuralink设备的患者。接受植入手术后，他彻夜都在玩文明游戏，这太棒了。这正是我也会做的事。即便只有约10%至15%的电极正常工作，我们已能实现每秒传输一位信息。这是此前世界纪录的两倍。或许五年后，我们可能实现每秒兆比特级的传输——远超人类打字或说话的速度极限。[761]

The Neuralink interface can massively increase your output bandwidth and your input bandwidth. Input being written operations to the brain, where the brain is reading signals.[762] If we achieve tight symbiosis, AI wouldn't be "other"—it would be integrated with you. Imagine it has a relationship to your conscious mind similar to your unconscious mind.[763]

The Neuralink interface can massively increase your output bandwidth and your input bandwidth. Input being written operations to the brain, where the brain is reading signals. | Neuralink接口能大幅提升你的输出带宽与输入带宽。输入指大脑接收信号的写入操作。[762] 若能实现深度共生，人工智能将不再是'他者'——它将与你融为一体。想象它与你的意识建立联系，如同潜意识与意识的关系。[763]

Your brain has to work to compress a bunch of concepts in your head into this incredibly low data rate format called speech or typing. That's what language is—a compression algorithm on thought, to transfer a concept. Then it's got to listen and decompress what's coming in. Both of these steps are very lossy.

你的大脑需耗费大量精力，将众多概念压缩成名为言语或打字的极低数据速率格式。语言的本质就是思想的压缩算法，用于传递概念。随后它必须接收并解压传入的信息。这两个步骤都存在严重的信息损耗。

If you have two direct-brain interfaces, you could do an uncompressed direct conceptual communication with another person. Like consensual telepathy. The conversation would be a conceptual interaction on a level that's difficult to conceive of right now.[764]

更多资源 https://mirrorsite.org

如果双方都拥有直接-脑部接口，就能实现无压缩的、直接的概念传递。如同达成共识的心灵感应。这种对话将成为概念层面的互动，其深度远超我们当前的认知范畴。[764]

> Conceivably, there's a way to have a digital layer of your brain feel like part of you. It's not something you offload to consciously; it's just "you."[765]
>
> 理论上，人脑的数字层可成为自我感知的延伸。这不是需要刻意调用的外置功能，而是构成'本我'的有机部分。[765]

To start out, we are really just solving basic neurological damage, like for people who have essentially complete or near complete loss from the brain to the body. For someone like Stephen Hawking, the Neuralink would be incredibly profound. Imagine if Stephen Hawking could communicate as fast as we're communicating, perhaps faster. And that's certainly possible. Probable, in fact.

现阶段我们主要解决基础神经损伤问题，例如帮助大脑与身体连接完全或近乎完全中断的患者。对史蒂芬·霍金这样的患者，Neuralink将具有划时代的意义。试想如果史蒂芬·霍金能以我们此刻的语速——甚至更快的速度进行交流。这当然是可能的。事实上很有可能。

There's obviously some risk with a new device. You can't get the risk down to zero; it's not possible. So, you want to have the highest possible reward, given there's a certain irreducible risk. And if somebody's able to have a profound improvement in their communication, that's worth the risk.[766]

新设备显然存在一定风险。风险无法降为零；这无法实现。因此，在固有风险无法消除的前提下，我们应追求最大化的收益回报。若患者能显著改善沟通能力，这样的风险就值得承担。[766]

更多资源 https://mirrorsite.org

We can deliver new information to the brain too. If somebody is completely blind, we can write directly to the visual cortex to give them sight. At first it will be relatively fairly low resolution, but long term you would have very high resolution.[767]

我们还能向大脑输送新信息。对于完全失明者，可通过直接刺激视觉皮层恢复视觉功能。初期分辨率将相对较低，但长期可实现超高分辨率成像。[767]

This is actually our second product, called Blindsight. It enables people who are completely blind, lost both eyes or optic nerve, or just can’t see at all, to be able to see by directly triggering the neurons in the visual cortex.[768]

这是我们的第二款产品'盲视'，能使完全失明者（包括眼球缺失、视神经损伤或全盲患者）通过直接激活视觉皮层神经元重获视力。[768]

At some point, the cybernetic implants wouldn’t simply be correcting things that went wrong but augmenting human capabilities. You could even see multispectral wavelengths like infrared, ultraviolet, and radar. That’s a superpower situation. Augmenting intelligence, senses, and bandwidth dramatically—that’s going to happen at some point.[769]

未来神经植入装置不仅能修复功能缺陷，还将增强人类能力。你甚至能观测红外线、紫外线及雷达等多频谱波段。这堪称超能力级场景。大幅增强智力、感官与带宽——这终将成为现实。[769]

更多资源 https://mirrorsite.org

THE LAST HUMAN DRIVERS

最后的人类驾驶员

It's crazy to let people drive a two-ton death machine manually. They can drive into whatever they want. In the future, it's going to seem like a mad thing that people once drove cars.[770]

让人手动操控两吨重的死亡机器实属荒谬。他们能撞向任意目标。未来回望人类曾亲自驾车，必将视作疯狂之举。[770]

In the early days of Tesla, 2013, a guy fell asleep at the wheel in a Model S, and he ran over a cyclist and killed him. Unfortunately, people fall asleep at the wheel often. If we had already built autopilot, this cyclist would still be alive. I thought, *We'd better hurry up and get it working*.[771]

2013年特斯拉初创期，一名Model S驾驶员途中睡着，碾压自行车骑手致其身亡。方向盘前打瞌睡实乃常见悲剧。若当时已实现自动驾驶，这位骑手本可幸免于难。我当即警醒：必须加速攻克技术难关。[771]

There are clearly two massive revolutions coming to the automobile industry; one is the transition to electrification, and then the other is autonomy. It became obvious to me that in the future, any car that does not have autonomy would be about as useful as a horse. That's not to say it has no use…but it is rare for somebody to have a horse these days. It's obvious cars will drive themselves completely; it's just a question of time.[772]

汽车行业即将迎来两大颠覆性变革；其一是电气化转型，其二是自动驾驶技术。我清醒地认识到，未来不具备自动驾驶功能的汽车，其使用价值将如同当今的马匹。这并非完全无用...但如今拥有马匹的人已寥寥无几。汽车必将实现完全自动驾驶；这只是时间问题。[772]

更多资源 https://mirrorsite.org

> An autonomous car is arguably worth five to ten times more than a car that is not autonomous.[773]
>
> 自动驾驶汽车的价值保守估计是非自动驾驶汽车的5到10倍。[773]

The autonomy system is likely to mitigate crashes except in rare circumstances. Vehicle safety is probabilistic. There's some chance any time a human driver gets in a car that they will have an accident that is their fault. The odds are never zero. The key threshold for autonomy is: How much better does autonomy need to be than a person before you can rely on it?[774]

除极端情况外，自动驾驶系统能有效降低事故发生率。车辆安全本质是概率问题。人类驾驶员每次驾车都存在因自身过失引发事故的可能性。事故概率永远不会为零。自动驾驶的关键标准在于：其可靠性需超越人类驾驶水平多少，才能获得充分信任？[774]

About a million people die every year in car accidents and about ten million per year have serious injuries. Bringing the day of self-driving sooner translates directly to lives saved and injuries avoided. The sooner, the better. A lot of lives will be saved and made better.[775]

全球每年约百万人死于车祸，另有千万人遭受严重创伤。让自动-驾驶时代早日到来，直接意味着挽救生命和避免伤害。推进速度越快越好。这将挽救大量生命并显著提升生活质量。[775]

Tesla deployed partial autonomy immediately because when used correctly, it was already significantly safer than a person driving by themself. It would be morally reprehensible to delay release simply for fear of bad press or some mercantile calculation of legal liability.[776]

特斯拉立即部署了部分自动驾驶功能，因为正确使用时，其安全性已显著超越人类驾驶员。若因畏惧负面舆论或商业化的法律风险算计而

更多资源 https://mirrorsite.org

推迟发布，这在道德上是不可接受的。[776]

Autonomous cars could maneuver with a reaction time much faster than a human. Over time, autopilot will be capable of impossible maneuvers that a human could never do.[777]

自动驾驶车辆的机动反应速度远超人类极限。随着技术演进，自动驾驶系统将实现人类驾驶员永远无法完成的高阶机动操作。[777]

I told the team I want the latest data on miles per intervention to be the starting slide at each of our meetings. If we're training AI to drive, what do we optimize? The answer is higher miles between interventions. It is motivating to watch each day as the miles per intervention increases. Video games without a score are boring.

我要求团队将最新'每次干预行驶里程'数据作为所有会议的首张演示页。若训练人工智能驾驶，我们应聚焦何种优化目标？核心指标在于延长每次人工干预之间的行驶里程。每日见证'每次干预行驶里程'数据的攀升，持续激发着团队动力。没有计分的电子游戏很无聊。

> We always try to do the right thing. When we make mistakes, it may be because we were being foolish or stupid, but it's always with the right motivations.[778]
>
> 我们始终努力做正确的事。当我们犯错时，可能是因为愚蠢或不明智，但动机始终正确。[778]

When true self-driving is approved by regulators, you will be able to summon your Tesla from pretty much anywhere. Once it picks you up, you will be able to sleep, read, or do anything else en route to your destination.[779]

更多资源 https://mirrorsite.org

当真正的自动-驾驶获监管批准后，你将能从几乎所有地点召唤你的特斯拉。车辆接载后，你可在前往目的地途中睡觉、阅读或做任何事。[779]

Mega-long-term, I think of cars as being effectively carriers for the autonomy software. It's the vehicle, literally and figuratively for autonomy. It's the software that rides on the car.[780]

超-长期-来看，汽车本质上是自动驾驶软件的载体。它在字面意义和比喻意义上都是自动驾驶的载体。汽车是软件的搭载平台。[780]

Eventually, self-driving cars will take the form of a shared autonomous fleet. You buy your car, and you could choose to use your car exclusively yourself, have it used only by friends and family, or only by other drivers who are rated five stars. You can choose to share it sometimes but not other times. That's 100 percent what will occur. It's just a question of when.[781]

最终，自动-驾驶汽车将形成共享自动驾驶车队。购买车辆后，您可选择仅供个人使用、仅限亲友使用，或仅向五星评级驾驶员开放共享。您可灵活选择时段开启共享功能。这必将成为现实。唯一的问题是时间。[781]

This autonomy shift is massive, because you could suddenly have five times the utility of the car you currently have. Say a normal passenger car gets ten to twelve hours a week of usage. An autonomous car could be used fifty to sixty hours a week.[782]

自动驾驶转型影响巨大，现有车辆的实用价值可能瞬间提升五倍。普通乘用车每周使用时长约十至十二小时。自动驾驶汽车每周可使用五十至六十小时。[782]

This is all good for the environment, because you need fewer cars to get the same thing done. We would need fewer parking lots and garages to store cars when they're not in use, because they're in use a lot more.[783]

更多资源 https://mirrorsite.org

这将显著改善环境，因为完成同等运输量所需车辆更少。由于车辆利用率大幅提升，闲置时所需的停车场和车库数量将减少。[783]

> If this is true, as autonomous driving capability is turned on for the Tesla fleet, it may be the biggest asset value increase in history…overnight.[784]
>
> 若该预测成真，一旦特斯拉车队启用自动驾驶功能，或将创下史上最惊人的资产价值跃升——一夜之间实现。[784]

So, in short, Master Plan Part Deux is: 简而言之，秘密宏图第二篇章的核心是：

- Create stunning solar roofs with seamlessly integrated battery storage.
- 打造与储能系统无缝整合的惊艳太阳能屋顶。
- Expand the electric vehicle product line to address all major segments.
- 拓展电动汽车产品线，全面覆盖主要细分市场。
- Develop a self-driving capability that is ten times safer than manual via massive fleet learning.
- 通过大规模车队学习，开发安全性能十倍于人工驾驶的自动-驾驶能力。
- Enable your car to make money for you when you aren’t using it.[785]
- 让您的车辆在闲置时为车主创造收益。[785]

I can’t say enough about the profundity of full self-driving. It will be one of the biggest changes in history. It’s not just some feature; it is as profound as electrification. We already have millions of cars on the road now able to achieve this with the right software update.[786]

完全自动-驾驶的深远意义无论如何强调都不为过。这将成为历史上最重大的变革之一。这不仅是某种功能升级；其革命性意义堪比电气化

更多资源 https://mirrorsite.org

浪潮。全球已有数百万辆上路车辆，通过软件升级即可实现此功能。[786]

Eventually, a vehicle must be designed as a clean Robotaxi. We’re going to take that risk. No mirrors, no pedals, no steering wheel. This will be a historically megarevolutionary product. It will transform everything. This is the product that makes Tesla a ten-trillion-dollar company. People will be talking about this moment in a hundred years.[787]

终极车型必须是为纯粹自动驾驶出租车而生，我们愿担此风险。无后视镜，无脚踏板，无方向盘。这将是一款具有历史性超级革命意义的产品。它将改变一切。正是这款产品让特斯拉成为价值十万亿美元的企业。百年之后，人们仍将铭记此刻。[787]

更多资源 https://mirrorsite.org

SUSTAINABLE ABUNDANCE

可持续性富足

> We’re accelerating the world’s transition to sustainable abundance.[788]
>
> 我们正加速推进世界向可持续性富足的转型进程。[788]

In Tesla’s Master Plan, Part 3, the thing we wanted to convey, more importantly than anything else, is that there is a clear path to a sustainable-energy Earth. It doesn’t require destroying natural habitats; it doesn’t require us to be austere and stop using electricity. We have published a detailed white paper with all of our assumptions and calculations of a clear path to a fully sustainable Earth, with abundance.

在特斯拉总体规划第三篇章中，我们最核心的诉求是阐明：通往可持续能源地球的路径清晰可见——既无需破坏自然栖息地，也不必要求人类节俭度日或停止用电。我们已发布详细白皮书，完整呈现了关于实现地球全面可持续富足的所有路径假设与计算模型。

In fact, you could support a civilization much larger on Earth. Much more than the current eight billion humans could be supported sustainably on Earth.

事实上，地球完全能够承载比现在庞大得多的文明。当前80亿人口远未达到地球可持续支撑的上限。

I’m often shocked by how few people realize this. Most of the smart people I know actually don’t see this clear path. They think there is no path to a sustainable energy future with our current population. Or that we’d have to

更多资源 https://mirrorsite.org

resort to extreme measures. None of this is true. In Master Plan, Part 3, we walk through the calculations for how to create a sustainable-energy civilization.[789]

很少有人意识到这一点，这常常令我感到震惊。我认识的大多数聪明人，其实都没能看清这条清晰路径。他们认为以当前人口规模，根本无法实现可持续能源的未来。或者觉得必须采取极端措施。这些观点都不正确。在《宏图计划》第三篇章中，我们详细阐述了如何构建可持续-能源文明的完整计算模型。[789]

A fully electrified and sustainable economy is within reach through the actions in this paper: 通过本文提出的行动方案，完全电气化的可持续经济触手可及：

1. Repower the existing grid with renewables
1. 使用可再生能源改造现有电网
2. Switch to electric vehicles
3. 全面转向电动载具
4. Switch to heat pumps in residential, business, and industry
5. 在住宅、商业及工业领域普及热泵系统
6. Electrify high-temperature heat delivery and hydrogen production
7. 实现高温-热能输送与氢气生产的电气化
8. Sustainably fuel planes and boats
9. 可持续地为飞机和船只提供燃料
10. Manufacture the sustainable energy economy
11. 构建可持续能源经济体系

Our models show the electrified and sustainable future is technically feasible and requires *less* investment and *less* material extraction than continuing today's unsustainable energy economy.[790]

我们的模型表明，电气化且可持续的未来在技术上是可行的，相比延续当今不可持续的能源经济，其需要的投资更少，资源开采量更少。[790]

更多资源 https://mirrorsite.org

The tools we make at Tesla help us build the products that advance human prosperity. Making technologically advanced products that are affordable and available at scale is required to build a flourishing and unconstrained society. It serves to further democratize society while raising everyone's quality of life in the process.

特斯拉制造的工具助力我们生产推动人类繁荣的产品。要建设繁荣无束缚的社会，必须制造技术先进、价格亲民且可大规模普及的产品。这将进一步促进社会民主化，同时在此过程中提升所有人的生活质量。

The hallmark of meritocracy is creating opportunities that enable each person to use their skills to accomplish whatever they imagine. Everyone deserves access to these opportunities, and technological growth can help ensure that each of us is able to maximize our most limited resource: time.

精英制度的标志在于创造机会，使每个人都能运用自身技能实现其设想的任何目标。每个人都应享有这些机会，而技术发展能确保我们最大化利用最有限的资源：时间。

734 "Elon Musk at TED2022."

734 "埃隆·马斯克在 TED2022大会上的演讲。"

735 "Birthrate Threat," WELT Documentary.

735 "生育率危机"，《世界报》 纪录片

736 "Birthrate Threat," WELT Documentary.

736 "生育率危机"，《世界报》 纪录片

737 Anderson and Musk, "A Future Worth Getting Excited About."

737 安德森与马斯克，《一个值得期待的未来》

738 "Birthrate Threat," WELT Documentary.

738 《生育率危机》，《世界报》 纪录片。

739 "Elon Musk at TED2022."

739 《埃隆·马斯克在 TED2022大会上》

更多资源 https://mirrorsite.org

740 Isaacson, *Elon Musk*.

740 沃尔特·艾萨克森，《埃隆 马斯克》。

741 Anderson and Musk, “A Future Worth Getting Excited About.”

741 安德森与马斯克，《值得期待的未来》

742 Ryan Knutson, “Elon Musk on 2024 Politics, Succession Plans and Whether AI Will Annihilate Humanity,” *The Journal*, podcast, May 24, 2023, 18:55, https://open.spotify.com/episode/7HyKBExI7aM0KAGZ6WzmgD?context=spotify:show:0KxdEdeY2Wb3zr28dMlQva&nd=1.

742 瑞安·努森，《埃隆·马斯克谈2024年政治立场、继任计划及人工智能是否会毁灭人类》，期刊播客，2023年5月24日，18:55，https://open.spotify.com/episode/7HyKBExI7aM0KAGZ6WzmgD?context=spotify:show:0KxdEdeY2Wb3zr28dMlQva&nd=1

743 “Elon Musk's NEW EPIC Rant.”

743 “埃隆·马斯克全新史诗级吐槽 。”

744 “Elon Musk's Vision for the Future.”

744 “埃隆·马斯克的 未来愿景。”

745 “Elon Musk's Vision for the Future.”

745 “埃隆·马斯克的 未来愿景。”

746 Musk (@elonmusk), X account.

746 马斯克 (@elonmusk)，X 账号。

747 Rogan and Musk, “JRE #1169.”

747 罗根与马斯克，《JRE #1169》。

748 Knutson, “Elon Musk on 2024 Politics.”

748 克努森，《埃隆·马斯克谈2024 政治》。

749 Berger, *Liftoff*.

749 伯杰，《升空》。

750 “Tesla AI Day 2022.”

750 “特斯拉AI日 2022。”

751 “Elon Musk (Full Interview) | Real Time with Bill Maher (HBO),” Real Time with Bill Maher, April 29, 2023, YouTube video, 21:20, https://www.youtube.com/watch?v=oO8w6XcXJUs.

更多资源 https://mirrorsite.org

751 “埃隆·马斯克（完整专访）| 实时秀（HBO）”，《实时秀》，2023年4月29日，YouTube视频，21:20，https://www.youtube.com/watch?v=oO8w6XcXJUs。

752 “Tesla AI Day 2022.”

752 “特斯拉AI日 2022。”

753 “Elon Musk,” *Real Time with Bill Maher*.

753 “埃隆·马斯克，”《比尔·马赫实时秀》

754 “Tesla AI Day 2022.”

754 “特斯拉AI日 2022”

755 “Tesla AI Day 2022.”

755 “特斯拉AI日 2022”

756 Tim Urban, “Neuralink and the Brain’s Magical Future,” *Wait But Why* (blog), April 20, 2017, https://waitbutwhy.com/2017/04/neuralink.html.

756 蒂姆·厄本，《神经连接与大脑的神奇未来》，《等等，但为什么》（博客），2017年4月20日，https://waitbutwhy.com/2017/04/neuralink.html。

757 Urban, “Neuralink and the Brain's Magical Future.”

757 厄本，《神经连接与大脑的神奇未来》。

758 Urban, “Neuralink and the Brain's Magical Future.”

758 厄本，《神经连接与大脑的神奇未来》。

759 “Elon Musk on How to Build the Future.”

759 “埃隆·马斯克谈如何构建 未来”

760 Urban, “Neuralink and the Brain's Magical Future.”

760 厄本，“Neuralink与大脑的神奇 未来”

761 “Elon Musk's NEW EPIC Rant.”

761 “埃隆·马斯克的全新史诗级 宣言”

762 “Elon Musk: Digital Superintelligence,” Y Combinator.

762 《埃隆·马斯克：数字超级智能》，Y Combinator。

763 Urban, “Neuralink and the Brain's Magical Future.”

更多资源 https://mirrorsite.org

763 厄本，《Neuralink与大脑的神奇 未来》。

764 Urban, “Neuralink and the Brain's Magical Future.”

764 厄本，《Neuralink与大脑的神奇 未来》。

765 Urban, “Neuralink and the Brain's Magical Future.”

765 厄本，《神经链接与大脑的魔法般 未来》

766 Fridman and Musk, “Lex Fridman Podcast #438.”

766 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

767 “Elon Musk: Digital Superintelligence,” Y Combinator.

767 《埃隆·马斯克：数字超级智能》，Y Combinator

768 Fridman and Musk, “Lex Fridman Podcast #438.”

768 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

769 “Elon Musk: Digital Superintelligence,” Y Combinator.

769 《埃隆·马斯克：数字超级智能》，Y Combinator

770 Fridman and Musk, “Lex Fridman Podcast #18.”

770 弗里德曼与马斯克，《莱克斯·弗里德曼播客第18期》

771 “Elon Musk,” Full Send Podcast.

771 《埃隆·马斯克》，全力播客

772 Fridman and Musk, “Lex Fridman Podcast #18.”

772 弗里德曼与马斯克，《莱克斯·弗里德曼播客#18》

773 Fridman and Musk, “Lex Fridman Podcast #18.”

773 弗里德曼与马斯克，《莱克斯·弗里德曼播客#18》

774 “The Future We're Building—and Boring.”

774 《我们正在建设的未来——以及 无聊》

775 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

775 克里希南与拉玛穆尔蒂，《埃隆·马斯克俱乐部会所访谈》

776 Musk, “Master Plan, Part Deux.”

更多资源 https://mirrorsite.org

776 马斯克，《总体规划，续篇》。

777 Fridman and Musk, “Lex Fridman Podcast #252.”

777 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

778 “2016 Annual Shareholder Meeting,” Tesla.

778 "2016年度股东大会"，特斯拉。

779 Musk, “Master Plan, Part Deux.”

779 马斯克，《总体规划，续篇》。

780 “Elon Musk Podcast,” ARK Invest.

780 《埃隆·马斯克播客》，ARK Invest

781 “The Future We're Building—and Boring.”

781 《我们正在建设的未来——以及 隧道工程》

782 “The Future We're Building—and Boring.”

782 《我们正在建设的未来——以及 隧道工程》

783 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

783 克里希南和拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》

784 “Elon Musk, Investor Day 2023.”

784 《埃隆·马斯克，2023年投资者日 》

785 Musk, “Master Plan, Part Deux.”

785 马斯克，《总体规划，部件 二》

786 “2023 Annual Shareholder Meeting,” Tesla.

786 “2023年度股东大会”，特斯拉。

787 Isaacson, *Elon Musk*.

787 沃尔特·艾萨克森，埃隆 马斯克。

788 The Tesla Team, *Master Plan Part IV* (Tesla, September 1, 2025), https://digitalassets.tesla.com/tesla-contents/image/upload/Tesla-Master-Plan-Part-4.pdf.

788 特斯拉团队，总体规划第四部分（特斯拉，2025年9月1日），https://digitalassets.tesla.com/tesla-contents/image/upload/Tesla-Master-Plan-Part-4.pdf。

更多资源 https://mirrorsite.org

789 “Elon Musk’s Tesla Master Plan 3 in 22 Mins (SUPERCUT),” Farzad, March 2, 2023, YouTube video, 22:48, https://www.youtube.com/watch?v=BoGNEZF2XFQ.

789 “埃隆·马斯克的特斯拉宏图计划第三篇章：22分钟精华版（超级剪辑）”，Farzad，2023年3月2日，22分钟视频，https://www.youtube.com/watch?v=BoGNEZF2XFQ。

790 Tesla Contributors and Advisors, *Master Plan Part 3: Sustainable Energy for All of Earth* (Tesla, April 5, 2023), https://www.tesla.com/ns_videos/Tesla-Master-Plan-Part-3.pdf.

790 特斯拉贡献者与顾问，《宏图计划第三篇章：地球可持续能源全覆盖》（特斯拉，2023年4月5日），https://www.tesla.com/ns_videos/Tesla-Master-Plan-Part-3.pdf。

更多资源 https://mirrorsite.org

OUR EXISTENTIAL RISKS

我们面临的生存风险

Don’t worry about it.

别担心。

I mean, worry about it.

其实，还是要担心的。

Because if you worry about it, ironically, it will be okay.

讽刺的是，正因为你担心了，事情反而会好转。

It will be a self-unfulfilling prophecy.[791]

这将成为一个自我-否定的预言。[791]

更多资源 https://mirrorsite.org

THIS IS THE BEST TIME TO BE ALIVE

这是人类最好的时代

Q: What period of history would you prefer to live in the most?

问：你最想生活在哪个历史时期？

> Right now. The present is the most interesting time in history—and I read a lot of history.
>
> 当下。此刻是历史上最精彩的时代——我读过大量历史。
>
> Let’s do our best to keep that going.[792]
>
> 让我们全力延续这盛世。[792]

I find history fascinating. A lot of incredible things have been done, good and bad. By learning about them, you understand the nature of civilization and individuals.[793]

历史令我着迷。人类完成了无数非凡之事，好坏皆有。通过了解这些，你能洞悉文明与个体的本质。[793]

There’s a lot of human history, but most of it is people getting on with their lives. Human history is not a nonstop war and disaster. Those are actually intermittent and rare. If they weren’t, humans would soon cease to exist. But historians write more about wars than peace. A normal year where

更多资源 https://mirrorsite.org

nothing major happened won't be written about much. Most people just farmed and lived their life as a villager somewhere.[794]

人类历史漫长，但大多时候人们只是过自己的日子。人类历史并非充斥着无休止的战争与灾难。那些实际上只是零星且罕见的。若非如此，人类很快便会消亡。但史学家对战争的记载远多于和平时期。平淡无奇、无重大事件发生的年份鲜被史书记载。大多数人终其一生不过是在某处务农为生的村民。[794]

Life was tough for most of history. In most of human history, a good year would be one where not that many people in your village died of disease, starvation, freezing, or being killed by a neighboring village. If you only lost 5 percent of your village in a year, that was a good year.[795]

在历史长河中，多数人的生活都残酷艰辛。人类历史的大部分时期，所谓好年景不过是村里未因疾病、饥荒、严寒或邻村杀戮而大量减员。若一年内村落仅失去百分之五的人口，便堪称丰年。[795]

Not starving to death would have been the primary goal of most people throughout history. Just making sure they had enough food to last through the winter and not freeze to death.[796]

对历史长河中的绝大多数人而言，首要目标仅是免于饿死。只求储备足够口粮熬过寒冬，免于冻死。[796]

> If you judge history from what is morally acceptable today, you'd give everyone a failing grade. I don't think anyone would get a passing grade in morality if you look back to even three hundred years ago.[797]
>
> 若以今日道德标准评判历史，所有时代都将被判为不及格。纵使回溯仅三百年，依我看也无人能在道德评判中及格。[797]

更多资源 https://mirrorsite.org

Q: How does history help you understand the future?

问：历史如何助你洞见未来？

I try to understand the rise and fall of civilizations. I've read a lot of history to discern the facts of what humans did.[798]

我致力于解读文明的兴衰规律。我遍览史籍以辨明人类行为的真实轨迹。[798]

We take for granted that "it's always going to be there," but if you study history, you realize civilizations rise and fall.[799]

人们惯于将'文明永续'视为理所当然，但历史研究表明文明始终处于兴衰循环之中。[799]

I was reading about the ancient Sumerians, who were arguably the first civilization. They were the first to develop writing, but eventually they died out. Then, nobody could read their writing at all. They were impressive in their time but they faded out as a civilization. The ancient Egyptians, the same thing. One after another. Ancient Greece had its day. There've been ebbs and flows in the Chinese and Indian civilizations over the eons as well.[800]

我曾研究古代苏美尔文明——其堪称人类最早的文明形态。他们首创文字系统，却终致文明湮灭。其后代无人能解其文字。虽曾辉煌于时代，终究化作历史的尘埃。古埃及文明亦然，文明更替如浪潮相续。古希腊有过鼎盛时期，中华与印度文明在漫长岁月中同样历经沧桑沉浮。[800]

Only a tiny fraction of what was ever written in history is available to us now. Probably less than 1 percent. If they didn't chisel it in stone or put it in a clay tablet, we don't have it. There are a few papyrus scrolls that are thousands of years old because they were deep inside a pyramid. The little information we have shows many civilizations rising and falling. It's wild. And the basics of human nature are more or less the same today.

更多资源 https://mirrorsite.org

现存历史记载仅为曾经文献的沧海一粟，保存比例恐不足百分之一。非石刻或泥板所载者，今皆无存。唯深藏金字塔内的数卷纸莎草文献，历经数千年得以幸存。我们掌握的有限信息表明，众多文明兴衰更迭，令人触目惊心。当今社会人性的本质依然大致相同。

We see patterns for civilizations as they go through a life cycle, like an organism does. A human is a zygote, fetus, baby, toddler, teenager, eventually gets older, and dies. Every civilization goes through a life cycle. No civilization will last forever.[801]

我们观察到文明如同有机体般经历着完整的生命周期。人类从受精卵、胚胎、婴儿、幼儿、青少年逐步成长，最终走向衰老死亡。每个文明都必然经历生命周期。没有文明能够永恒存在。[801]

The birth rate might be the biggest single threat to the future of human civilization. Artificial intelligence (AI) gone wrong is a big concern. Religious extremism is a concern. There are quite a few important problems to solve.[802]

出生率下降可能是人类文明未来面临的最大单一威胁。人工智能失控构成重大隐患。宗教极端主义同样不容忽视。亟待解决的重要问题为数众多。[802]

We should view our civilization as much more fragile than we think.[803]

我们应当清醒认识：文明远比想象中更为脆弱。[803]

We must keep civilization going onward and upward as much as possible and try to minimize the civilizational threats that occur.[804]

更多资源 https://mirrorsite.org

必须全力推动文明持续向前发展，同时将潜在的文明威胁尽量降至最低。[804]

更多资源 https://mirrorsite.org

WORLD WAR III

第三次世界大战

I'm not predicting a world war anytime soon. But given enough time, it will likely happen. This has been our pattern in the past. In the last century we had two massive world wars, three if you count the Cold War. It's unlikely that we'll *never* have another world war. We probably will at some point.[805]

我并非预言世界大战即将爆发。但假以时日，战火重燃的可能性极大。这是我们过去的固有模式。上世纪我们经历了两次世界大战，若计入冷战则是三次。人类永不再爆发世界大战的可能性微乎其微，未来某个时间点很可能会再度发生。[805]

Any war is tragic and difficult on a local basis. Then some wars are civilization-ending, or have that potential. Global thermonuclear warfare has a high potential to end civilization, perhaps permanently. But it could severely wound civilization and set back human progress to the Stone Age.

任何战争在局部层面都是惨痛的悲剧。而某些战争具有终结文明的潜力。全球热核战争极可能导致文明复灭，甚至可能是永久性的终结。即便不终结文明，也可能重创文明根基，使人类进步倒退至石器时代。

> We want to prioritize avoiding civilizational risks over things that are painful and tragic on a local level, but are not civilizational risks.[806]
>
> 相较于局部性灾难，我们必须优先规避文明存续级风险。[806]

更多资源 https://mirrorsite.org

Few people alive today viscerally understand the horrors of war, at least in the US.

当今在世者中，切身理解战争恐怖的人凤毛麟角——至少在美国境内如此。

This concerns me.

这令我深感忧虑。

Obviously people on the front lines in Ukraine and Russia understand how terrible war is, but how many people in the West understand it? My grandfather was in World War II. He was severely traumatized. For almost six years he was fighting in eastern North Africa and Italy. All his friends were killed in front of him. He would've died there too, except they finally gave him an IQ test. After the test, he was transferred to British intelligence in London.

显然乌俄前线民众深谙战争之残酷，但西方世界又有几人真正明白？我的祖父参加过第二次世界大战。他遭受了严重的精神创伤。他在北非东部和意大利战斗了近六年。所有战友都在他眼前牺牲。若非最后接受智商测试，他也会命丧战场。测试后他被调往伦敦的英国情报部门。

From the war, he had extreme PTSD (post-traumatic stress disorder). Like next level. He just didn't talk. Ever. If you tried talking to him, he'd just tell you to shut up. He won a bunch of medals. Never bragged about it once, not even hinted at it. Nothing. I found out by searching his military records online.

战争给他留下了极端的创伤后应激障碍（post-traumatic stress disorder）。堪称最高级别。他从不开口说话。若有人试图交谈，只会得到闭嘴的呵斥。他获得过许多勋章。他从未炫耀，甚至未曾提及。完全沉默。我是通过网上查询军方记录才得知的。

更多资源 https://mirrorsite.org

He knows the horrors of war. He would say, “No way in hell do you want war. Avoid it at all costs.” But he died thirty years ago. How many people are alive now who viscerally remember World War II? Not many.[807]

他深知战争恐怖。常说：'绝不想要战争，必须不惜一切代价避免。'但他已去世三十年。如今还能切身体会二战记忆的幸存者还剩多少？寥寥无几。[807]

I recommend people read about World War I warfare in detail. It’s rough. The sheer number of people who died is mind boggling. There’s a saying from World War I, “Young boys who don’t know each other, killing each other on behalf of old men that do know each other.” What the hell is the point of that?[808]

我建议人们详细研读第一次世界大战的战史。那段历史残酷至极。死亡人数之多令人难以置信。第一次世界大战有句名言：'素不相识的少年，为彼此熟识的老者互相残杀。'这究竟有何意义？[808]

> Something must stop the cycle of reciprocal violence. Something must stop it or it will never stop. Just eye for an eye, tooth for a tooth, limb for a limb, life for a life, forever and ever.[809]
>
> 必须有什么来打破这种以暴易暴的循环。必须有什么来阻止它，否则它将永无止境。永远都是冤冤相报：以眼还眼，以牙还牙，以肢还肢，以命偿命。[809]

I recommend reading Isaac Asimov’s *Foundation* series. The premise is protecting society through a dark age. My guess is there will be another dark age at some point.

我推荐阅读艾萨克·阿西莫夫的基地系列。其核心思想是在黑暗时代守护社会。我认为文明在某个阶段必将再次陷入黑暗时代。

更多资源 https://mirrorsite.org

I’m not predicting we’re about to enter a dark age. But there is some probability that we will, particularly if there’s a third world war. We need to ensure there are enough of us, enough of a seed of human civilization to revive civilization and shorten the length of a dark age.[810]

并非预言我们将立即步入黑暗时代。但若爆发第三次世界大战，这种可能性确实存在。我们必须确保留存足够的人类文明火种，以重启文明并缩短黑暗时代的周期。[810]

> Asimov’s Zeroth Law: Take the set of actions most likely to support the humanity of the future.[811]
>
> 阿西莫夫第零定律：采取最有可能支持未来人类发展的行动集合。[811]

更多资源 https://mirrorsite.org

REGULATION ACCUMULATION

监管积弊

> Be cautious about the gradual creep of regulations and bureaucracy.[812]
>
> 警惕监管与官僚主义的渐进式蔓延。[812]
>
> Humans die, but the laws they created don't.[813]
>
> 人会消亡，但他们制定的法律却长存。[813]

The early auto industry was a hotbed of innovation at the beginning of the twentieth century. Many regulations were since added in attempts to protect consumers. The government tends to stand in the way of innovation, even with good intentions. Sometimes they overregulate industries to the point where innovation becomes difficult.

二十世纪初的汽车产业曾是创新温床。此后为保护消费者而增设了大量监管条例。政府往往成为创新的阻碍，即便出于善意。有时监管过度导致创新举步维艰。

It's crazy how much regulation there is. You can argue and get these things changed, but it takes ages. One of the things we're trying to change is the requirement for side mirrors. Why should cars need them when tiny video cameras can display an image inside the car instead? I met with the US Secretary of Transportation and asked, "Can you change this regulation?" Still, nothing has happened. That was in 2011.[814]

更多资源 https://mirrorsite.org

现行监管体系臃肿得离谱。虽可据理力争推动变革，但过程旷日持久。我们正致力废除的条例之一就是侧视镜强制安装要求。既然微型摄像头能在车内显示图像，汽车何必安装实体镜？我曾当面询问美国交通部长："这条监管能改吗？"然而至今无果，这已是2011年的事。[814]

> I am incredibly compliant.[815]
>
> 我非常遵守规定。[815]

We wouldn't be allowed to put cars on the road if we did not comply with the vast body of automotive regulations. If we don't comply with *all of them* we can't sell the car. If we don't comply with *all of the regulations* for SpaceX or for Starlink, they shut us down. My companies are cumulatively overseen by a few *hundred* regulatory agencies.[816]

若不遵守海量汽车法规，我们的车辆根本不能上路。若未满足全部要求，汽车就无法销售；若未遵循针对太空探索技术公司或星链的所有监管规定，业务就会被叫停。旗下企业累计接受数百家监管机构监督。[816]

Once in a while, there will be something I disagree with. If I disagree with a regulation, it's because I believe a regulation meant to do good does not actually do good. I believe it is my obligation to object to a regulation that does not serve the public good. That's the only time I object.

偶尔会遇到不认同的规定。若反对某条监管规则，必因该规则本欲行善却适得其反。反对有损公共利益的规定是我的义务。仅在此种情况下我才会反对。

Q: But you typically don't like regulations, correct? We read many articles about you pushing back on the regulators.

更多资源 https://mirrorsite.org

问：但你通常反感监管规定，对吗？我们读过许多关于你与监管机构交锋的报道。

Don’t take what the media presents as the whole picture. This is not an exaggeration: There are probably 100 million regulations that my companies comply with. There are maybe five that we disagree with.

切勿将媒体报道视为全貌。毫不夸张地说：我的公司遵守的监管条例可能多达1亿条。其中仅有5条是我们持有异议的。

If you sum up only the arguments I had with hundreds of regulators over decades, it can sound terrible. The media does this without mentioning the 100 million regulations we agreed with. They focus only on the five I disagreed with. People only hear about the five and think, “Wow, this guy’s a real maverick.”[817]

若仅统计我数十年来与数百名监管者的争论，听上去可能很糟糕。媒体对此只字不提，完全不提我们认同的1亿条监管规定。他们只聚焦于我反对的5条。人们只听说这5条，便觉得'哇，这人真是特立独行'。[817]

> The natural tendency is for the hand of the government to get heavier every year.[818]
>
> 政府监管力度逐年加重是必然趋势。[818]

The government told me if SpaceX hired anyone who is not a permanent resident of the United States I would go to prison. The presumption is that if somebody’s not a permanent resident, they might take the rocket technology to countries that would use it to cause harm to the United States. Okay, solid reasoning. I agree.[819]

政府曾警告，若太空探索技术公司雇佣非美国永久居民，我将面临监禁。其预设逻辑是：若非永久居民，可能将火箭技术带回敌对国家危

更多资源 https://mirrorsite.org

害美国。好吧，理由充分，我认同。[819]

Then a few years later, the Department of Justice sued SpaceX for failing to hire asylum seekers.

几年后，美国司法部起诉太空探索技术公司未能雇佣寻求庇护者。

If we hire anyone who's not a permanent resident, we go to prison. Now, we're told if we don't hire asylum seekers, we also go to prison. That seems insane.

若雇佣非永久居民，我们将面临牢狱之灾。如今被告知若不雇佣寻求庇护者，同样会锒铛入狱。这简直荒谬至极。

We have to work to actively reduce the number of laws and regulations. Otherwise, as more laws and regulations are passed, eventually everything becomes illegal. You get into these Orwellian situations where going left is illegal and going right is illegal. There isn't anything you can do that *is* legal.

我们必须积极削减法律法规的数量。否则随着法规不断累积，最终所有行为都将违法。陷入这种奥威尔式困境：左行违法，右行亦违法。根本没有任何合法可行之事。

That's why the California High-Speed Rail project has built only a tiny section that doesn't even have rail on it, even after spending several billion dollars. California has made almost everything illegal. No one can make progress. This is why we can't build high-speed rail in America. It's illegal.

这就是加利福尼亚州高速铁路项目耗资数十亿美元后，仅建成一小段无轨路段的原因。加利福尼亚州几乎将万物定为非法。任何建设都寸步难行。这就是美国无法建造高速铁路的根源——此举违法。

> It's not an engineering failure; it's the regulations.[820]

更多资源 https://mirrorsite.org

这不是工程学失败，而是监管的问题。[820]

Something needs to change. Civilization's arteries harden over time and we get less and less done because there's a rule against everything.[821]

必须做出改变。文明的动脉会随时间硬化，我们完成的事越来越少，因为每件事都有规则禁止。[821]

Obviously we don't want world wars, but wars can have some silver lining. After World Wars I and II, there were huge resets on rules and regulations. Historically, what has cleared away the cobwebs of regulation has been war.[822]

显然我们不希望发生世界大战，但战争也可能带来一线曙光。第一次和第二次世界大战后，规则和监管都经历了重大重置。历史上，破除监管积弊的往往是战争。[822]

Regulators and legislators create new rules and regulations every year, but don't put any effort into removing them.[823] Without a cleansing function for rules and regulations, they accumulate every year. This is a problem.[824]

Regulators and legislators create new rules and regulations every year, but don't put any effort into removing them. | 监管者和立法者每年制定新规，却从不努力废除旧规。[823] 若没有清除机制，监管规则就会逐年累积。这是个严重问题。[824]

Eventually, we're like Gulliver, tied down by thousands of little strings. You can't move. No single one of those strings is the issue. The problem is there are a million of them.[825] We lose our freedom, one regulation at a time.[826]

更多资源 https://mirrorsite.org

Eventually, we’re like Gulliver, tied down by thousands of little strings. You can’t move. No single one of those strings is the issue. The problem is there are a million of them. | 最终我们会像格列佛那样，被千万根细绳捆住而动弹不得。单看任何一根细绳都不是问题所在。问题在于这样的细绳数以百万计。[825] 我们的自由正被每一条监管逐步蚕食。[826]

更多资源 https://mirrorsite.org

UNSUSTAINABLE ENERGY

《不可持续的能源》

> Generating sustainable energy is the biggest environmental issue that we face.[827]
>
> 开发可持续能源是我们面临的最大环境问题。[827]

I'm much less of a climate alarmist than people might think. But we're running this climate experiment, which we know is pointless because eventually we will run out of coal, oil, and gas. This experiment is not going to last forever. We have to transition to something that is long term because we will run out of hydrocarbons to burn. Let's just not run the experiment.[828]

我远没有人们想象的那么热衷敲响气候警钟。但我们正在进行的这个气候实验注定徒劳，因为煤炭、石油和天然气终将耗尽。这个实验不可能永远持续下去。我们必须转向长期可持续的能源方案，因为可燃烧的碳氢化合物终将枯竭。不如直接终止这个实验。[828]

Long term, most of civilization's energy is going to come from solar. Obviously the sun only shines during the day and sometimes it's cloudy, so we need batteries. Solar will be the main way that civilization is powered long term.

长远来看，人类文明所需的大部分能源将来自太阳能。显然太阳只在白天发光且时有阴云，因此我们需要电池储能系统。太阳能将成为未来文明的主要能源供给方式。

更多资源 https://mirrorsite.org

As long as the sun is shining we'll be fine.

只要太阳持续照耀，人类就能安然无恙。

If humanity had to get all of its energy from the sun, it could.

即使人类必须完全依赖太阳获取能源，这也完全可行。

Sometimes people say, "What about clouds?" Here is my response, "Do plants grow?" They grow through a solar-powered chemical reaction. If plants grow, you have solar power.[829]

当有人质疑'阴天怎么办？'，我的回应是：'植物是否生长？'它们通过太阳能-驱动的化学反应实现生长。若植物能够生长，便证明存在太阳能。[829]

But between now and then we need to maintain nuclear power. I can't emphasize enough, please do not shut down the nuclear power plants and please reopen the ones that have been shut down. It is total madness to shut them down. Total madness.[830]

但在过渡期间，我们必须维持核能发电。我郑重强调：切勿关闭核电站，请重启已关停的核设施。关闭核电站实属疯狂，彻头彻尾的疯狂。[830]

I'm in favor of nuclear power in any place not subject to extreme natural disasters. Nuclear power is a great way to generate electricity. Obviously we should not be starting up coal plants and shutting down nuclear plants. It doesn't make any sense at all. Coal plants are a hundred to a thousand times worse for our health than nuclear power plants.[831]

更多资源 https://mirrorsite.org

我支持在不受极端自然灾害影响的任何地区发展核能。核能是卓越的发电方式。显然我们不应重启燃煤电厂却关停核电站。这完全不合逻辑。燃煤电厂对健康的危害程度远超核电站百倍乃至千倍。[831]

How many people have actually died from nuclear accidents? Practically none. How many people have died from coal plants? It's a very big number.[832]

核事故实际致死人数几何？几乎为零。燃煤电厂致死人数几何？这是非常庞大的数字。[832]

It's a national security risk to shut these things down. It's not only bad for the climate; it is a national security risk as well. People don't understand that coal power plant emissions cause many deaths every year. They are far more dangerous than nuclear power plants.[833]

关停核设施将构成国家安全风险。此举不仅危害气候环境；更是国家安全隐患。大众尚未认知到，燃煤电厂排放物每年导致大量人员死亡。它们比核电站危险得多。[833]

The future of energy will be primarily solar with wind. We absolutely need stationary storage batteries because of the intermittency of both solar and wind. There will also be hydroelectric, geothermal, and nuclear—these are all good. Battery cell production is the fundamental rate-limiter slowing down a sustainable-energy future. Very important problem.[834]

未来能源将主要依靠太阳能和风能。由于太阳能和风能的间歇特性，固定式储能电池不可或缺。水电、地热与核能也将发挥重要作用——这些都是优质能源。电池单元生产是制约可持续能源发展的根本速率限制器，这是极其关键的问题。[834]

We want to move as quickly as we can to a solar electric economy. The faster we get there, the better it is for the world.[835]

更多资源 https://mirrorsite.org

我们正加速推进太阳能电力经济转型。实现目标的速度越快，对全球越有利。[835]

> We could probably have a civilization that is a hundred times as energy intensive as we currently have it.[836]
>
> 我们完全有能力构建能源密集度百倍于当前水平的文明。[836]

更多资源 https://mirrorsite.org

MISALIGNED ARTIFICIAL SUPERINTELLIGENCE

未对齐的人工超级智能

I've never seen any technology grow as fast as AI, and I've seen a lot of technology.[837]

我从未目睹过像人工智能这般迅猛发展的技术，而我亲历过众多技术革新。[837]

We're quite close to digital superintelligence, which will be smarter than any human at anything. Hopefully they will discover new physics; I think they will. They're definitely going to invent new technologies.[838]

我们已十分接近数字超级智能，它将在任何领域超越人类智慧。希望他们能发现新物理学；我认为他们会的。他们必将发明新技术。[838]

Digital superintelligence is also a potential great filter. I hope it isn't, but it might be.

数字超级智能同样可能成为大过滤器。但愿不会如此，但可能性确实存在。

We must be very careful in how we develop AI. It's a great power, and with great power comes great responsibility. It would be wise for us to have (at least) an objective third party who can go in and understand what the various leading players are doing with AI. Even if there's no enforcement ability, at least they can voice concerns publicly.[839]

我们必须极其谨慎地开发人工智能。这是强大的力量，能力越大责任越大。明智的做法是设立（至少）一个客观第三方机构，能够介入并了解各领先企业在人工智能领域的进展。即便没有强制执法权，至少可以公开表达关切。[839]

更多资源 https://mirrorsite.org

> The pace of progress matters a lot. We don't want to develop digital superintelligence too far before being able to do a merged brain–computer interface.[840]
>
> 发展速度至关重要。在实现脑机融合接口之前，我们不应过度发展数字超级智能。[840]

We're on the cusp of an artificial intelligence revolution. For a very long time, we've been the smartest creatures on Earth. That's been our defining characteristic. Now, what happens when there's something way smarter than us?[841]

我们正处于人工智能革命的临界点。长久以来，人类始终是地球上最智慧的生物。这始终是我们的定义性特征。试想，若存在远超人类智能的存在会如何？[841]

AI is obviously going to surpass human intelligence by a lot. There's some risk that something bad happens, something humanity can't control after that point. Either a small group of people monopolize AI power, the AI goes rogue, or something like that. It may not, but it could.[842]

人工智能必将大幅超越人类智能，届时存在风险隐患：可能引发人类无法控制的恶性事件。或是少数群体垄断AI力量，或是AI系统失控，诸如此类。未必会发生，但存在可能性。[842]

If AI superintelligence is linked to human will, particularly a large number of humans, it would be guided to an outcome desired by a large group, because it would be a function of their will.

若超级智能与人类意志——尤其是群体意志——深度绑定，其发展轨迹将体现大众诉求，成为群体意愿的具象化。

更多资源 https://mirrorsite.org

If our communication bandwidth is too low, our integration with AI would be weak. The AI is going to go off by itself, because we're too slow to talk to or work with. The faster the communication, the more we'll be integrated—the slower the communication, the less.

若人机交互带宽不足，人类与AI的融合将流于表层。AI将自行其是，因人类思维速度难以企及其运作节奏。通信速率决定融合深度：速率愈高则愈融合，愈低则愈疏离。

The more separate we are—the more the AI is "other"—the more likely it is to turn on us. If the AIs are all separate and vastly more intelligent than us, how do we ensure they don't have optimization functions contrary to the best interests of humanity?

人机分离程度愈深——AI愈具'异己'属性——其反噬风险愈高。当分散式AI系统全面超越人类智能时，如何确保其优化函数不悖于人类根本利益？

We may end up with the choice of either being useless and left behind, or being a pet—like a house cat—unless we figure out some way to be symbiotic and merge with AI. (A house cat would be a good outcome, by the way.)

除非找到与人工智能共生融合的途径，否则结局要么是被淘汰变得毫无价值，要么成为宠物——如同家猫一般。（顺带一提，成为家猫已属理想结果。）

Q: How do we reduce the risk that AI becomes a "great filter"?

问：如何降低人工智能成为'大过滤器'的风险？

We must build benign AI that loves humanity. It is extremely important to build AI with a rigorous adherence to truth, even if that truth is politically incorrect. My intuition is AI could be very dangerous if you force it to believe things that are not true.[843]

更多资源 https://mirrorsite.org

我们必须创建热爱人类的良性人工智能。构建恪守真相的人工智能至关重要，即便该真相不符合政治正确标准。我的直觉是，若强令人工智能相信虚假信息，将导致极度危险。[843]

Jeff Hinton invented a number of the key principles in artificial intelligence. He puts the probability of annihilating the human race around 10–20 percent. Mitigating the risks of AI is important.[844] We should be concerned about having AI be vastly beyond us and decoupled from human will.[845]

Jeff Hinton invented a number of the key principles in artificial intelligence. He puts the probability of annihilating the human race around 10–20 percent. Mitigating the risks of AI is important. | 杰夫·辛顿奠定了人工智能领域的多项核心原理。他预估人类灭绝概率约为10%至20%。 缓解人工智能风险具有重大意义。[844] 我们应警惕人工智能远超人类智能且脱离人类意志控制的局面。[845]

You get dangerous outcomes when you program AI to be politically correct. Things that may seem relatively innocuous now will not be in the future if AI has immense power.

为人工智能植入政治正确程序将引发危险后果。当前看似相对无害的事物，若人工智能掌握巨大权力，未来将不再无害。

Take the Google Gemini example, where it refused to produce a picture of George Washington as a white man. In fact, any historical figure would automatically be made diverse because it had been programmed to insist on diversity. That sounds okay at first, but what if the AI has so much power it can actually *enforce* diversity?

以谷歌双子座为例，它拒绝生成白人形象的乔治·华盛顿照片。实际上，所有历史人物都会被自动多元化呈现，因其程序被设定为必须坚持多元化原则。初听尚可，但若人工智能权力膨胀到能真正强制推行多元化呢？

更多资源 https://mirrorsite.org

It could decide there are too many of one kind of people, and kill people until the diversity amount is what it has been programmed to believe is "correct."[846]

它可能判定某类人群数量过剩，进而消灭人类直至多元化程度符合其程序设定的'正确'标准。[846]

> Mark my words: If we do not program AI to be as truthful as possible, that is where it will go. That is where the danger lies.[847]
>
> 请谨记：若不将人工智能设定为极致求真，事态必将滑向深渊。这才是真正的危险所在。[847]

Superpowerful AI programmed in this way has severe civilization-level risk. I've seen quite a few technologies develop, but none with this level of risk. Artificial general intelligence (AGI) is a significantly higher risk than nuclear weapons, in my opinion.[848]

如此编程的超级人工智能存在严重的文明-层级风险。我见证过诸多技术发展，但从未有哪种技术具备如此量级的风险。在我看来，通用人工智能（AGI）的风险远高于核武器。[848]

The core plot premise of *2001: A Space Odyssey* was that things went wrong when they forced the AI (known as HAL 9000) to lie. The AI was not allowed to let the crew know about the monolith that they were going to see but it also had to take the crew to the monolith. The conclusion of the AI was to kill the crew and take their bodies to the monolith.[849]

*2001*太空漫游的核心剧情设定是： 当人类强迫人工智能（ 即HAL 9000）撒谎时，灾难就发生了。该AI既不能告知宇航员即将见到黑色方碑的真相，又必须将他们带往方碑所在地。最终人工智能的解决方案是：杀死宇航员，将尸体运往方碑。[849]

更多资源 https://mirrorsite.org

The lesson there is: Don’t force an AI to lie or do things that are axiomatically incompatible, or mutually impossible. Don’t force AI to lie, even if the truth is unpleasant.[850]

这个教训告诉我们：切勿强迫AI撒谎或执行公理上相悖、或相互矛盾的任务。即便真相令人不快，也不要强迫AI说谎。[850]

Honesty is the best policy.[851] We want to have a maximally truthful AI, even if what it says is not “politically correct.” We want it to focus on being as accurate as possible.[852]

Honesty is the best policy. | 诚实至上。[851] 我们需要一个最大限度追求真实的人工智能，即使其言论不符合'政治正确'。我们要确保它专注于提供尽可能准确的信息。[852]

I can’t emphasize this enough. A rigorous adherence to truth is the most important thing for AI safety. And, obviously, empathy for humanity and life as we know it.[853]

这一点再怎么强调都不为过。严格坚持真理对人工智能安全至关重要。当然，还要对我们所知的人类和生命怀有同理心。[853]

AI mirrors the mistakes of its creators.[854]

人工智能会反映其创造者的错误。[854]

更多资源 https://mirrorsite.org

Q: Do you think anyone should be trying to regulate this?

问：您认为是否应该有人尝试对此进行监管？

There are regulations around anything that is a physical danger to the public. Cars, communications, rockets, aircraft, and medication are all heavily regulated.[855]

更多资源 https://mirrorsite.org

任何对公众构成物理危险的事物都存在相关监管规定。汽车、通信、火箭、飞机和药品都受到严格监管。[855]

The general philosophy about regulation is there needs to be some government oversight when something is a danger to the public. People often don't understand how slow regulation tends to work. It's slow.[856]

监管的总体理念是：当某物对公众构成危险时，需要政府进行监督。人们往往不了解监管过程有多缓慢。它确实很慢。[856]

Usually, some new technology will cause damage or death. Then there will be an outcry. Then there will be an investigation. Years will pass. Then there will be an insight committee. Then they get to rule-making. Then there will be oversight, and eventually regulation and enforcement. This all takes years. This is the normal course of new regulations.

通常，某项新技术会造成损害或死亡事件。随后将引发强烈抗议。接着会展开调查。数年过去。然后成立调查委员会。之后他们开始规则-制定。 随后建立监督机制，最终出台监管法规并强制执行。整个过程需要数年。这是新法规出台的正常流程。

Look at automotive regulations. The auto industry successfully fought any regulations on seat belts for more than a decade, even though the numbers were extremely obvious. If you had a seat belt on, you were far less likely to die or be seriously injured. Unequivocally. Eventually, after many people died for years, regulators insisted on seat belts.

看看汽车法规。尽管数据极其明显，汽车产业仍成功抵制安全带相关法规长达十余年。系安全带能显著降低死亡或重伤概率，这是毫无疑问的。最终在多年伤亡事故后，监管机构才强制要求配备安全带。

This time frame is not relevant to artificial intelligence. You can't take ten years from the point it becomes dangerous. It's too late.[857]

这种时间框架与人工智能无关。从危险显现那一刻起，你不可能有十年缓冲期；那时已为时已晚。[857]

更多资源 https://mirrorsite.org

> I was trying to sound the alarm on the AI front for quite a while, but it was clearly having no impact.
>
> 我曾在人工智能领域持续发出警报，但显然收效甚微。
>
> I realized we couldn’t stop it, so we’ll have to try to develop it in a good way.[858]
>
> 意识到无法阻止其发展后，我们只能尝试引导其走向良性轨道。[858]

This is what we are addressing at Neuralink. Our initial goal is to help people who are quadriplegics or tetraplegics be able to operate their phone or computer. There is always some risk in the beginning, because it’s new technology. The risk–reward trade has to make sense. If you’re quadriplegic and with the Neuralink you can operate a phone even faster than someone with working thumbs, that would be a life-changer.[859]

这正是Neuralink公司致力解决的问题。我们的首要目标是帮助四肢瘫痪患者实现手机和电脑操作。新技术应用初期总会伴随风险。风险回报的权衡必须合理。如果你是四肢瘫痪患者，通过Neuralink操作手机的速度甚至能快过双手健全的人，那将是改变人生的突破。[859]

There are a bunch of other things that could be addressed, like extreme depression or morbid obesity, where people die at age thirty-five. We could literally change the setting in your brain and turn off hunger.[860]

还有许多问题可被解决，比如重度抑郁症或病态肥胖——这类患者通常在三十五岁就面临死亡。我们能够直接调节大脑设定，关闭饥饿感。[860]

更多资源 https://mirrorsite.org

Memory enhancement can help people who have memory problems, which could allow them to function well much later in life. Mental disablement of one kind or another happens to all of us if we get old enough.[861]

记忆增强技术可帮助存在记忆障碍的人群，使其在更晚的人生阶段仍能保持正常功能。只要活得足够久，每个人都难免遭遇某种形式的精神障碍。[861]

Brain–computer interfaces are stunning technology. There may be a way to take the signals from the motor cortex in the brain and send signals to the spine past where the neurons are broken. If so, paralyzed people could move their bodies again.

脑机接口是颠覆性的技术突破。可能存在一种方法：采集大脑运动皮层的信号，绕过神经元断裂点将指令传输到脊柱。若是如此，瘫痪者将能重新活动肢体。

We may enable people to walk again, which would be wild. Even full-body reanimation. Jesus-level stuff.[862]

我们或许能让人们重新行走，这将是突破性的创举。甚至实现全身复苏。 耶稣级别的奇迹。[862]

更多资源 https://mirrorsite.org

POPULATION COLLAPSE

人口崩溃

> A low birth rate is a slow death for a civilization.[863]
>
> 低出生率是文明缓慢消亡的征兆。[863]

Most historians overlook the role of low birth rates in the decline of civilizations.[864] Will Durant has it correct in *The Story of Civilization*. A counterintuitive thing happens when civilizations are prosperous for too long—the birth rate declines.[865]

Most historians overlook the role of low birth rates in the decline of civilizations. | 多数历史学者忽视了低出生率在文明衰败中的作用。[864] 威尔·杜兰特在《文明的故事》中阐述得准确：当文明繁荣过于长久时，会发生反直觉现象——出生率下降。[865]

The same thing happened in ancient Rome. Julius Caesar and Augustus saw the problem but couldn't solve it. Rome fell because the Romans stopped making Romans. That was the fundamental issue.

古罗马同样遭遇此劫。尤利乌斯·凯撒与奥古斯都洞察危机却无力回天。罗马衰亡的根本在于罗马人停止了繁衍后代。

Yes, there were other causes. They had a series of malaria epidemics, plagues, and whatnot. But they had those before, too. It became fatal when the birth rate was far lower than the death rate.[866]

更多资源 https://mirrorsite.org

诚然，其他因素同样存在。他们经历了一系列疟疾疫情、瘟疫等等。但之前也发生过这些情况。当出生率远低于死亡率时，情况才变得致命。[866]

If the birth rate is below the replacement rate and that trend continues, we will eventually disappear. It’s elementary.

若出生率低于更替水平且趋势持续，我们终将消失。这是显而易见的。

At a base level: no humans, no humanity.[867]

根本而言：没有人类，就没有人类文明。[867]

更多资源 https://mirrorsite.org

若出生率持续低于更替水平，人类终将消亡。这是基本事实。

Durant looked at one civilization after another, hundreds of them. They all went through the same cycle. When the civilization was under stress, the birth rate was high. But as soon as there were no external enemies or they had an extended period of prosperity, the birth rate inevitably dropped. Every time. I don’t believe there’s a single exception.[868]

杜兰特研究了上百个文明，一个接一个。它们都经历了相同的循环。当文明面临压力时，出生率往往很高。但一旦没有外部敌人或经历长

更多资源 https://mirrorsite.org

期繁荣，出生率就无可避免地下降。每一次都是如此。我不相信存在任何例外。[868]

> Population collapse is a real and immediate concern.[869]
>
> 人口崩溃是真实且迫切的隐忧。[869]

Twenty years ago, I noticed birth rates were trending toward being below replacement level in every wealthy country. We always have to be cautious about extrapolating any demographic curve…but if you extrapolate the curves, *if* these trends continue, these countries will dwindle into insignificance. They might completely die out.[870]

二十年前，我就注意到所有富裕国家的出生率都开始呈现低于更替水平的趋势。我们必须始终谨慎对待任何人口曲线的推演...但若据此推演，如果这些趋势持续，这些国家将逐渐衰微至无足轻重。它们可能会彻底灭绝。[870]

It’s easy to predict what the population of any given country will be. Just take how many babies were born, multiply that by life expectancy, and that’s what the population will be if the birth rate continues to that level. It’s very straightforward.[871]

预测任何国家的人口数量很简单：只需统计新生婴儿数量，乘以人均预期寿命，若生育率保持当前水平，据此推算未来人口规模。这非常直接明了。[871]

You can see the demographic trends clearly. It’s a very slow-moving ship. You know who’s going to be an adult in twenty years based on who was born last year.[872]

人口变化趋势清晰可见。这就像一艘缓慢航行的巨轮。根据去年出生人口，就能推知二十年后成年人口规模。[872]

更多资源 https://mirrorsite.org

China had a one-child policy. About 2015 they changed it to a two-child policy, then a few years later they changed it to a three-child policy. The birth rate kept plummeting the whole time. They recently had their lowest growth rate ever. China's birth rate reached 40 percent below replacement. Japan is far along in this. Japan declined by six hundred thousand people in 2021.[873]

中国曾实行独生子女政策。约2015年调整为二孩政策，数年后又改为三孩政策。出生率持续暴跌。其增长率近期创历史新低。中国出生率已低于更替水平40%。 日本在此方面尤为严重。2021年日本人口减少60万。[873]

The US has been below replacement rates since the early 1970s. The only reasons the population is increasing are immigration and people living longer. People living longer is why the population of Earth isn't plummeting already—but it will.

美国自20世纪70年代初便低于更替水平。人口增长的唯一原因是移民迁入及寿命延长。寿命延长是地球人口尚未锐减的原因——但未来必将下滑。

Q: There seem to be a lot of people concerned about overpopulation. Isn't that more of a problem than underpopulation?

问：似乎许多人担忧人口过剩问题。这难道不比人口不足更严重吗？

> The biggest myth that exists right now is this "overpopulation" myth.
>
> 当今最大的认知谬误就是'人口过剩'迷思。
>
> In fact, we have a population collapse problem.[874]

更多资源 https://mirrorsite.org

> 实际上我们面临的是人口崩溃危机。[874]

They are operating on beliefs that were true in the past but are no longer true.[875] These are not subjective matters; you can look at the birth rate. It's an objective number. How many babies were born? There are obvious public records of this information.[876]

They are operating on beliefs that were true in the past but are no longer true. | 他们秉持着过去成立而现今失效的认知。[875] 这些并非主观议题；出生率数据昭然若揭。这是客观数值。新生儿数量是多少？这些信息有明确的公开记录。[876]

I'm pro-environment, but the environmental movement has gone too far.[877] The extremist environmentalists view humans as a blight on Earth.[878]

I'm pro-environment, but the environmental movement has gone too far. | 我亲环境，但环保运动已走向极端。[877] 极端环保主义者将人类视为地球的疮痍。[878]

Environmentalism started out with good intentions but paved the road to hell. It started to view humans as bad. As a burden on the earth that it couldn't sustain. These views are completely false.[879] Most people in the world are operating under the false impression there are too many people. This is not true. They think that having kids is bad for the environment. It is not.[880]

Environmentalism started out with good intentions but paved the road to hell. It started to view humans as bad. As a burden on the earth that it couldn't sustain. These views are completely false. | 环保主义始于善意，却铺就了通往地狱之路。它开始将人类视为恶的存在，视为地球无法承受的负担。这些观点完全错误。[879] 全球多数人错误地认为人口过剩，事实并非如此。他们认为生育有害环境，实则不然。[880]

更多资源 https://mirrorsite.org

Earth could sustain a human population ten times the current level.[881] Do a first-principles analysis. How much land area do we need to grow food? How much would that encroach on natural habitats? What's the actual food growing potential? Is there enough water? There's plenty of water because Earth is mostly water—70 percent water by surface area. Desalinization is very inexpensive. There's not a shortage of water, surface area, or energy to grow food.[882]

Earth could sustain a human population ten times the current level. | 地球足以承载十倍于现有人口规模。[881] 进行第一性原理分析。种植粮食需要多少土地面积？这会侵占多少自然栖息地？实际的粮食种植潜力如何？水资源充足吗？水资源非常丰富，因为地球表面70%都是水。海水淡化的成本非常低廉。种植粮食不存在水源、土地面积或能源短缺问题。[882]

We need to revive the idea of having children as a social duty; otherwise civilization will just die.[883] I keep banging on the baby drum because declining birth rates have been the source of civilizational collapse over and over again throughout history. Let's try to get this one right.[884]

We need to revive the idea of having children as a social duty; otherwise civilization will just die. | 我们必须重振生育作为社会义务的观念；否则文明终将消亡。[883] 我持续敲响婴儿鼓警钟，因为纵观历史，出生率下降一再成为文明崩溃的根源。让我们努力扭转这个局面。[884]

I've heard people say many times, "How can I bring a child into this terrible world?"

常听人说'我怎能让孩子降临在这个糟糕的世界？'

I'm like, *"Have you read any history?!* Because this is a very good time. Things were *way worse* at every other time, ever."[885]

我的回应是：'你读过历史吗？！现在明明是最好的时代以往每个时期都比现在糟糕得多[885]

更多资源 https://mirrorsite.org

Having children is the most optimistic thing somebody could do. It means you care about and believe in the future.[886] I always encourage my friends to have kids, and I'm happy to see many of them do.[887] Afterward, they thank me. Not one person has said they regret it. Ever.[888]

Having children is the most optimistic thing somebody could do. It means you care about and believe in the future. | 生育后代是人类能做的最乐观的事，这代表你关心并相信未来。[886] I always encourage my friends to have kids, and I'm happy to see many of them do. | 我总是鼓励朋友们要孩子，看到很多人这么做我很欣慰。[887] 事后他们都感谢我。从未有人表示后悔。一次都没有。[888]

We are biologically inclined to love and nurture our children. To find it deeply fulfilling. If we weren't, we would have ceased to exist long ago. Take a wolf or some other aggressive creature. When that creature has babies, the mother nurtures them and is tender and caring. We've all evolved to love our offspring. It's a natural thing. And it's a relatively fun thing to do![889]

人类生理上天生就具备爱护养育子女的本能。从中获得深切的满足感。若非如此，人类早该灭绝了。就像狼这类攻击性动物—— 当它们诞下幼崽时，母兽照样会温柔哺育照料。爱护后代是人类进化出的天性。这再自然不过。而且养育过程本身充满乐趣！[889]

I had my first kid when I was twenty-nine. As of now, I have twelve kids with three women. Trying to set a good example here—having a lot of kids.[890] I get more joy from my kids than anything else in my life. I'm not saying that's the main reason to have kids, we should have them anyway, but my kids are certainly the greatest source of joy in my life.[891]

I had my first kid when I was twenty-nine. As of now, I have twelve kids with three women. Trying to set a good example here—having a lot of kids. | 我二十九岁有了第一个孩子。至今已与三位伴侣育有十二个子女。我这是以身作则——多生孩子树榜样。[890] 子女们带给我的喜悦远胜世间

更多资源 https://mirrorsite.org

万物。我并非主张生育的主要意义在于此，但无论如何我们都应养育后代——我的孩子们确实是我生命中最珍贵的喜悦源泉。[891]

We should increase the population of Earth, not decrease it.[892]

我们应当增加而非减少地球人口。[892]

Go forth and multiply.[893]

生生不息。[893]

更多资源 https://mirrorsite.org

ASTEROIDS AND COMETS

小行星与彗星

> A big rock will hit Earth eventually. We currently have no defense.[894]
>
> 巨型陨石终将撞击地球。目前我们毫无防御手段。[894]

If you think truly long term, you realize eventually there will be some natural disaster—even if it is not made by humans—that destroys all life on Earth.[895]

若以真正长远的视角思考，终将发生的自然灾害——即便非人为所致——必将摧毁地球所有生命。[895]

Most people are probably aware of Halley's Comet. Slightly under once per century, Halley's Comet comes near us. There are probably many objects, many comets that have long periods we simply don't know exist. There are billions, maybe trillions of objects in the outer solar system. Some of them are super-long-period comets.

哈雷彗星广为人知，它约每世纪接近地球一次。宇宙中很可能存在众多我们尚未知晓的长周期彗星。外太阳系存在着数十亿乃至数万亿的天体。其中部分属于超长周期彗星。

For example, when the comet Shoemaker-Levy hit Jupiter, it made a hole in Jupiter the size of Earth. If that hits Earth, that is game over. Dead. Everything is dead.[896]

更多资源 https://mirrorsite.org

例如，当舒梅克-列维彗星撞击木星时，它在木星表面形成了地球大小的巨坑。倘若此类撞击发生在地球上，那便是彻底终结。死亡。万物俱灭。[896]

For all of history, Earth did not have any ability to stop asteroids. Now with Starship we have *some* ability to stop small asteroids. Large asteroids and comets are still a danger.

在整个人类历史中，地球始终不具备拦截小行星的能力。如今凭借星舰，我们已拥有一定拦截小型小行星的能力。大型小行星与彗星仍是潜在威胁。

There's always some risk of this occurring. The probable lifespan of all forms of life is much greater if we're a multiplanet and ultimately a multistellar civilization.[897]

此类灾难始终存在发生的风险。唯有成为多行星文明并最终迈向星际化文明，所有生命形式的预期存续周期才可能大幅延长。[897]

791 Anderson and Musk, "A Future Worth Getting Excited About."

791 安德森与马斯克，《一个值得期待的未来》。

792 "Tesla AI Day 2022."

792 "特斯拉AI日 2022。"

793 Fridman and Musk, "Lex Fridman Podcast #252."

793 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

794 Fridman and Musk, "Lex Fridman Podcast #252."

794 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

795 Fridman and Musk, "Lex Fridman Podcast #252."

795 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

796 Fridman and Musk, "Lex Fridman Podcast #252."

796 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

更多资源 https://mirrorsite.org

797 Fridman and Musk, “Lex Fridman Podcast #252.”

797 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

798 Peterson and Musk, “Dr. Peterson x Elon Musk.”

798 彼得森与马斯克，《彼得博士彼得森 x 埃隆 马斯克》

799 “Elon Musk: 10X Every 6 Months.”

799 “埃隆·马斯克：每6 个月实现十倍增长。”

800 “Elon Musk: 10X Every 6 Months.”

800 “埃隆·马斯克：每6 个月实现十倍增长。”

801 Fridman and Musk, “Lex Fridman Podcast #438.”

801 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》。

802 “Birthrate Threat,” WELT Documentary.

802 《生育率危机》，WELT 纪录片

803 “Elon Musk: 10X Every 6 Months.”

803 《埃隆·马斯克：每6 个月实现十倍增长》

804 “Elon Musk: 10X Every 6 Months.”

804 《埃隆·马斯克：每6 个月实现十倍增长》

805 “Elon Musk Answers Your Questions,” SXSW 2018.

805 “埃隆·马斯克回答你的问题”，2018年西南偏南大会 。

806 Lex Fridman and Elon Musk, “Elon Musk: War, AI, Aliens, Politics, Physics, Video Games, and Humanity | Lex Fridman Podcast #400,” Lex Fridman, November 9, 2023, YouTube video, 2:16:46, https://www.youtube.com/watch?v=JN3KPFbWCy8.

806 莱克斯·弗里德曼与埃隆·马斯克，《埃隆·马斯克：战争、人工智能、外星人、政治、物理学、电子游戏与人类 | 莱克斯·弗里德曼播客 #400》，莱克斯·弗里德曼，2023年11月9日，YouTube视频，2小时16分46秒，https://www.youtube.com/watch?v=JN3KPFbWCy8。

807 Fridman and Musk, “Lex Fridman Podcast #400.”

807 弗里德曼与马斯克，《莱克斯·弗里德曼播客第400期》

808 Fridman and Musk, “Lex Fridman Podcast #400.”

808 弗里德曼与马斯克，《莱克斯·弗里德曼播客第400期》

更多资源 https://mirrorsite.org

809 Fridman and Musk, “Lex Fridman Podcast #400.”

809 弗里德曼与马斯克，《莱克斯·弗里德曼播客第400期》

810 “Elon Musk Answers Your Questions,” SXSW 2018.

810 《埃隆·马斯克回答你的问题》，西南偏南大会 2018年

811 “Elon Musk Answers Your Questions,” SXSW 2018.

811 《埃隆·马斯克回答你的提问》，西南偏南大会 2018。

812 “Elon Musk on Tesla, SpaceX,” *WSJ*.

812 《埃隆·马斯克谈特斯拉与太空探索技术公司》，《华尔街日报》。

813 Fridman and Musk, “Lex Fridman Podcast #252.”

813 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

814 “CHM Revolutionaries: An Evening with Elon Musk.”

814 "计算机历史博物馆革新者：与埃隆·马斯克共度夜晚"访谈活动

815 “Elon Musk on Advertisers,” DealBook Summit 2023.

815 "埃隆·马斯克谈广告主"，DealBook峰会2023

816 “Elon Musk on Advertisers,” DealBook Summit 2023.

816 "埃隆·马斯克谈广告主"，DealBook峰会2023

817 “Elon Musk on Advertisers,” DealBook Summit 2023.

817 《埃隆·马斯克谈广告商》，交易书峰会 2023

818 Peterson and Musk, “Dr. Peterson x Elon Musk.”

818 彼得森与马斯克，《博士彼得森 x 埃隆 马斯克》

819 Peterson and Musk, “Dr. Peterson x Elon Musk.”

819 彼得森与马斯克，‘博士彼得森 x 埃隆 马斯克》

820 Fridman and Musk, “Lex Fridman Podcast #438.”

820 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》。

821 Fridman and Musk, “Lex Fridman Podcast #252.”

821 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

更多资源 https://mirrorsite.org

822 Fridman and Musk, “Lex Fridman Podcast #438.”

822 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》。

823 “Elon Musk on Tesla, SpaceX,” *WSJ*.

823 “埃隆·马斯克谈特斯拉与太空探索技术公司”，《华尔街日报》。

824 Fridman and Musk, “Lex Fridman Podcast #252.”

824 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

825 Fridman and Musk, “Lex Fridman Podcast #438.”

825 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

826 “CHM Revolutionaries: An Evening with Elon Musk.”

826 《计算机历史博物馆革新者：与埃隆· 马斯克的夜晚》

827 “Jeff Skoll Talks with Elon and Kimbal Musk.”

827 《杰夫·斯科尔对话埃隆与金巴尔· 马斯克》

828 “Birthrate Threat,” WELT Documentary.

828 《生育率危机》，《世界报》 纪录片

829 “Birthrate Threat,” WELT Documentary.

829 《生育率危机》，《世界报》 纪录片

830 “Birthrate Threat,” WELT Documentary.

830 《生育率危机》，《世界报》 纪录片

831 Fridman and Musk, “Lex Fridman Podcast #252.”

831 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

832 Fridman and Musk, “Lex Fridman Podcast #252.”

832 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

833 “Birthrate Threat,” WELT Documentary.

833 《生育率危机》，《世界报》 纪录片

834 Musk (@elonmusk), X account.

834 马斯克（@elonmusk），X 平台账户

更多资源 https://mirrorsite.org

835 “Birthrate Threat,” WELT Documentary.

835 《生育率危机》，《世界报》 纪录片

836 Musk, “Caltech Commencement Speech.”

836 马斯克，加州理工学院 毕业典礼演讲

837 Diamandis and Musk, “AGI Safety, Superintelligence, and Neuralink.”

837 迪亚曼迪斯与马斯克，通用人工智能安全、超级智能与 神经链接

838 “Elon Musk: Digital Superintelligence,” Y Combinator.

838 《埃隆·马斯克：数字超级智能》，Y Combinator。

839 Fridman and Musk, “Lex Fridman Podcast #400.”

839 弗里德曼与马斯克，《莱克斯·弗里德曼播客#400》。

840 Urban, “Neuralink and the Brain's Magical Future.”

840 厄本，《Neuralink与大脑魔法般的未来》。

841 Rogan and Musk, “JRE #2054.”

841 罗根与马斯克，《JRE #2054》

842 Urban, “Neuralink and the Brain's Magical Future.”

842 厄本，《神经连接与大脑的神奇 未来》

843 “Elon Musk: Digital Superintelligence,” Y Combinator.

843 《埃隆·马斯克：数字超级智能》，Y Combinator

844 Fridman and Musk, “Lex Fridman Podcast #438.”

844 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》。

845 Rogan and Musk, “JRE #1470.”

845 罗根与马斯克，《JRE第1470期》。

846 “Elon Musk: 10X Every 6 Months.”

846 《埃隆·马斯克：每6 个月实现十倍增长》。

847 “Elon Musk: 10X Every 6 Months.”

847 《埃隆·马斯克：每6 个月实现十倍增长》。

更多资源 https://mirrorsite.org

848 Musk (@elonmusk), X account.

848 马斯克 (@elonmusk)，X 账号。

849 Diamandis and Musk, “AGI Safety, Superintelligence, and Neuralink.”

849 迪亚曼迪斯与马斯克，《通用人工智能安全、超级智能与 Neuralink》。

850 Diamandis and Musk, “AGI Safety, Superintelligence, and Neuralink.”

850 迪亚曼迪斯与马斯克，《通用人工智能安全、超级智能与 Neuralink》。

851 Musk (@elonmusk), X account.

851 马斯克 (@elonmusk)，X 账户。

852 Diamandis and Musk, “AGI Safety, Superintelligence, and Neuralink.”

852 迪亚曼迪斯与马斯克，《通用人工智能安全、超级智能与 Neuralink》。

853 “Elon Musk: Digital Superintelligence,” Y Combinator.

853 《埃隆·马斯克：数字超级智能》，Y Combinator。

854 Musk (@elonmusk), X account.

854 马斯克 (@elonmusk)，X 账号。

855 “Elon Musk on Advertisers,” DealBook Summit 2023.

855 “埃隆·马斯克谈广告商”，DealBook峰会 2023。

856 Rogan and Musk, “JRE #1169.”

856 罗根与马斯克，“JRE #1169”。

857 Rogan and Musk, “JRE #1169.”

857 罗根与马斯克，《JRE #1169》

858 Urban, “Neuralink and the Brain's Magical Future.”

858 厄本，《神经连接与大脑的神奇 未来》

859 “Elon Musk,” Full Send Podcast.

859 《埃隆·马斯克》，全力播客

860 “Elon Musk,” Full Send Podcast.

860 “埃隆·马斯克”，《全送播客》 。

更多资源 https://mirrorsite.org

861 Urban, “Neuralink and the Brain's Magical Future.”

861 厄本，《神经连接与大脑的神奇 未来》。

862 “Elon Musk,” Full Send Podcast.

862 “埃隆·马斯克”，《全送播客》 。

863 “Elon Musk,” Full Send Podcast.

863 “埃隆·马斯克”，《Full Send 播客》

864 “Elon Musk on How to Save the Human Race at #2024 Milken Conference,” Electron media group, inc., May 7, 2024, YouTube video, 40:34, https://www.youtube.com/watch?v=s5o5m7LP6YY.

864 “埃隆·马斯克在2024年米尔肯全球会议谈如何拯救人类”，电子媒体集团公司，2024年5月7日，YouTube视频，40:34，https://www.youtube.com/watch?v=s5o5m7LP6YY

865 Fridman and Musk, “Lex Fridman Podcast #438.”

865 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

866 Fridman and Musk, “Lex Fridman Podcast #438.”

866 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

867 Fridman and Musk, “Lex Fridman Podcast #438.”

867 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

868 Fridman and Musk, “Lex Fridman Podcast #438.”

868 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

869 Fridman and Musk, “Lex Fridman Podcast #438.”

869 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

870 Peterson and Musk, “Dr. Peterson x Elon Musk.”

870 彼得森与马斯克博士表示：彼得森 x 埃隆 马斯克》

871 Peterson and Musk, “Dr. Peterson x Elon Musk.”

871 彼得森与马斯克，“Dr. 彼得森 x 埃隆 马斯克》

872 “Elon Musk on How to Save the Human Race,” Milken Conference.

872 “埃隆·马斯克谈如何拯救人类”，米尔肯 会议。

873 “Elon Musk,” Full Send Podcast.

更多资源 https://mirrorsite.org

873 “埃隆·马斯克”，Full Send 播客。

874 “Elon Musk,” Full Send Podcast.

874 “埃隆·马斯克”，Full Send 播客。

875 “Elon Musk,” Full Send Podcast.

875 《埃隆·马斯克》，全力推送 播客

876 “Elon Musk,” Full Send Podcast.

876 《埃隆·马斯克》，全力推送 播客

877 “Elon Musk,” Full Send Podcast.

877 《埃隆·马斯克》，全力推送 播客

878 Peterson and Musk, “Dr. Peterson x Elon Musk.”

878 彼得森与马斯克，“Dr. 彼得森 x 埃隆 马斯克》

879 Peterson and Musk, “Dr. Peterson x Elon Musk.”

879 彼得森与马斯克博士彼得森 x 埃隆 马斯克》

880 Musk, “Caltech Commencement Speech.”

880 马斯克，《加州理工学院毕业典礼 演讲》

881 “Birthrate Threat,” WELT Documentary.

881 《生育率危机》，《世界报》 纪录片

882 Peterson and Musk, “Dr. Peterson x Elon Musk.”

882 彼得森与马斯克，《博士彼得森 x 埃隆 马斯克》

883 Isaacson, *Elon Musk*.

883 沃尔特·艾萨克森，《埃隆 马斯克》。

884 Fridman and Musk, “Lex Fridman Podcast #438.”

884 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》。

885 Musk, “Caltech Commencement Speech.”

885 马斯克，《加州理工学院毕业典礼 演讲》。

886 Peterson and Musk, “Dr. Peterson x Elon Musk.”

更多资源 https://mirrorsite.org

886 彼得森与马斯克，“博士彼得森 x 埃隆 马斯克》

887 “Elon Musk's NEW EPIC Rant.”

887 “埃隆·马斯克全新史诗级 怒喷。”

888 Peterson and Musk, “Dr. Peterson x Elon Musk.”

888 彼得森与马斯克，“博士彼得森 x 埃隆 马斯克》

889 Peterson and Musk, “Dr. Peterson x Elon Musk.”

889 彼得森与马斯克，「博士」彼得森 x 埃隆 马斯克》

890 “Elon Musk,” Full Send Podcast.

890 《埃隆·马斯克》，全力发送 播客

891 “Elon Musk on How to Save the Human Race,” Milken Conference.

891 《埃隆·马斯克谈如何拯救人类》，米尔肯 会议

892 Peterson and Musk, “Dr. Peterson x Elon Musk.”

892 彼得森博士与马斯克彼得森 x 埃隆 马斯克》

893 Fridman and Musk, “Lex Fridman Podcast #438.”

893 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》

894 Musk (@elonmusk), X account.

894 马斯克（@elonmusk），X 账号

895 Dodd, “Starship-Catching Tower.”

895 多德，《星舰捕捉 塔》

896 Dodd, “Starship-Catching Tower.”

896 多德，《星舰捕捉 塔》

897 Dodd, “Starship-Catching Tower.”

897 多德，《星舰捕获 塔》

更多资源 https://mirrorsite.org

BECOMING MULTIPLANETARY

成为多行星物种

The window of opportunity is open right now to make life multiplanetary.

当前正是实现生命多行星化的关键机遇期。

We cannot count on it being open for a long time.

我们无法指望这个窗口会长期敞开。

We need to take advantage while this window is open.[898]

必须趁此窗口期把握机遇。[898]

更多资源 https://mirrorsite.org

BECOMING MULTIPLANETARY IS AN EVOLUTIONARY-SCALE EVENT

实现多行星化是演化级事件

Deciding what is important through the lens of history is a good way to distinguish what seems important now from what is truly important over the long term.[899]

通过历史视角甄别事务重要性，是区分当下表象价值与长期实质意义的有效方法。[899]

If we get to Mars and beyond, that will seem far more important in historical context than anything else we do. Things like the Soviet Union will be forgotten or merely remembered by arcane historical scholars. The invasion of Iraq won't even be a footnote.[900]

若人类能抵达火星乃至更远深空，在历史长河中这远比任何其他成就更为重要。诸如苏联的兴衰将被遗忘，或仅存于冷僻的历史学者记忆中。入侵伊拉克甚至不会成为历史的一个注脚。[900]

If you zoom out and look at a long period of time—a four-billion-year history of Earth and the evolution of life itself—there are only about six major milestones. Single-celled life, multicellular life, the differentiation into plants and animals, the transition from ocean creatures to land mammals, and consciousness.

若从宏观视角审视漫长的时间跨度——追溯地球四十亿年的历史及生命本身的演化历程——仅存在约六个重大里程碑。单细胞生命、多细胞生命、动植物分化、海洋生物向陆生哺乳动物的过渡，以及意识的诞生。

更多资源 https://mirrorsite.org

Life becoming multiplanetary also belongs on this list of milestones. It would be at least as important as life going from the oceans to land, probably more significant.[901]

生命实现多行星化也应列入这一里程碑序列。其重要性至少等同于生命从海洋登陆陆地，很可能更具划时代意义。[901]

The universe appears to be 13.8 billion years old. Earth is about 4.5 billion years old. In another 0.5 billion years the sun will expand and make life impossible on Earth. If it had taken consciousness 10 percent longer to evolve, it would never have evolved at all. Just 10 percent longer.

宇宙约存在138亿年。地球年龄约45亿年。再过5亿年，太阳膨胀将使地球生命无法存活。若意识演化多花10%的时间，就将永远无法形成。仅需多花10%的时间。

> Any species that does not become multiplanetary is simply waiting around until their extinction event, either self-inflicted or external.[902]
>
> 任何不实现多行星化的物种，不过是在等待灭绝事件的发生——无论是自取灭亡还是外部因素所致。[902]

The geological history of Earth is long and complicated. There have been many extinction events, not just a few. Read about the great extinction events in the fossil record. If you do, you'll see there have been five major extinctions where 80 to 90 percent of all creatures on Earth died.

地球的地质历史漫长而复杂。灭绝事件层出不穷，绝非寥寥数次。查阅化石记录中的重大灭绝事件便知。若予查证，便会发现地球曾经历五次大灭绝，导致80%至90%的生物消亡。

更多资源 https://mirrorsite.org

In the Permian Extinction, 90 to 95 percent of all species were destroyed. Frankly, that doesn't tell the whole story because most of what remained were sponges, fungi, and things like that. Unless you were a mushroom or a cockroach, you died. Almost no large life survived the Permian Extinction.[903]

二叠纪大灭绝中，90%至95%的物种惨遭灭绝。坦率而言，这远非全貌——幸存者多为海绵、真菌之类生物。若非蘑菇蟑螂之属，皆难逃死劫。二叠纪大灭绝中，大型生物几近绝迹。[903]

This doesn't count the *many* cases where entire continents were destroyed. That happened a lot, but wouldn't count as a major extinction. Yellowstone erupts every seven hundred thousand years or so. That would destroy pretty much all life in North America. At least we'll see that one coming now, thanks to our current technology.[904]

这尚未计入整片大陆覆灭的诸多案例。这类事件时常发生，但算不上大灭绝事件。黄石火山每隔约七十万年喷发一次。那将摧毁北美大陆几乎所有生命。所幸凭借现有技术，我们至少能预见其来临。[904]

> Humans can cause our own extinction too; other creatures didn't have that option.[905]
>
> 人类也可能导致自身灭绝；其他生物则无此选择权。[905]

I'm a fan of Carl Sagan. He had a great way of putting things: "All of our consciousness, all our civilizations, everything we've ever known and done is on this one tiny blue dot."

我是卡尔·萨甘的拥趸。他的表述极为精妙："所有意识、所有文明，我们认知与创造的一切，都存在于这颗小小蓝点之上。"

更多资源 https://mirrorsite.org

People get too trapped in their squabbles among humans. They don't think of the big picture. They take civilization and our continued existence for granted. We shouldn't do that. Look at the history of civilizations: they rise and they fall.

人们总是深陷人类内部的琐碎纷争。却忽视了宏观图景。将文明的存续视为理所当然，此乃大忌。纵观文明史：兴衰更迭周而复始。

Now there's no geographic isolation. Our civilization is globalized, so civilization rises and falls together. This is a big risk. This should be the most important lesson of history: Things don't always go up.[906]

如今地理隔离不复存在。我们的文明具有全球性，荣损俱为一体。此乃重大隐患。这应是历史给予我们的核心警示：事物并非总是向上发展。[906]

I'm fairly optimistic about the future of Earth. I don't want people to have the wrong impression, like we're all about to die. Things will most likely be okay for a long time on Earth. Most likely, but nothing is certain.[907]

我对地球的未来相当乐观。我不希望人们产生误解，以为人类即将灭亡。地球很可能在很长一段时间内都会安然无恙。可能性很大，但世事无绝对。[907]

When I talked to Stephen Hawking many years ago, he thought there was roughly a 1 percent chance of civilization ending in any given century. Even a 1 percent chance of consciousness ending is still too much. It's worth spending a fair bit of effort to ensure we back up the biosphere, or build planetary redundancy. This is important. It's like Russian roulette where ninety-nine barrels are empty. Every century is a click. Click, click, click. Eventually…[908]

多年前我与史蒂芬·霍金交流时，他认为每个世纪文明终结的概率大约有1%。 即便是1%的意识终结概率，风险依然过高。投入相当精力确保生物圈备份或建立行星级冗余系统，这完全值得。此事至关重要。

更多资源 https://mirrorsite.org

这就像玩九十九个弹膛空置的俄罗斯轮盘赌。每个世纪都相当于一次扣扳机。扣动，再扣动...终有一天...[908]

> Making life multiplanetary is one of the most important things we could accomplish. This will help preserve the light of consciousness.
>
> 实现生命多行星化是我们能达成的最重要成就之一。这将有助于保存意识之光。

The probability of consciousness existing for a long time becomes much greater if we're on two independent planets. If something catastrophic happened to Earth, life would still exist on another planet.[909]

如果我们能在两个独立的星球上生存，文明长久延续的概率将大幅提升。倘若地球遭遇灾难性事件，生命仍可在另一颗行星延续。[909]

Say there was a giant meteor impact, a supervolcano, a massive nuclear war, or some super virus. It might not destroy human civilization, but it could knock us back to a much lower technology level, and then we risk a decline to our extinction.[910]

例如巨型陨石撞击、超级火山喷发、大规模核战争或某种超级病毒。这些未必会彻底毁灭人类文明，但可能导致技术大幅倒退至更低水平，继而面临灭绝风险。[910]

There are certain things we simply cannot avoid on Earth. Is it within your power or mine to stop World War III? I don't think so.[911]

地球上某些灾难实难避免。你我的能力范围能阻止第三次世界大战吗？我认为不能。[911]

更多资源 https://mirrorsite.org

We may get hit by a comet like the dinosaurs. If the dinosaurs had spaceships, they'd probably still be around. Even if we dodge all of that, the sun will continue to expand and eventually engulf Earth and destroy all life in the solar system.[912]

我们可能重蹈恐龙覆辙，遭遇彗星撞击。若恐龙当年拥有宇宙飞船，或许至今犹存。即便躲过所有劫难，太阳持续膨胀终将吞噬地球，摧毁太阳系所有生命。[912]

There's a pretty substantial bifurcation in our future: We're either out there among the stars on many planets or confined to Earth until some eventual extinction.[913]

人类未来面临重大分岔：要么成为星际多行星物种，要么困守地球直至最终灭绝。[913]

This is the first moment in 4.5 billion years that it has been possible to extend life beyond Earth.[914]

这是45亿年来首次有可能将生命延续至地球之外。[914]

更多资源 https://mirrorsite.org

IF YOU LOVE LIFE, PROTECT IT

若热爱生命，请守护它

I've read a lot of history, including the darkest, worst parts of it. Despite all that, I still love humanity. This is why I care about us becoming a multiplanet species, a spacefaring civilization—because I love humanity. I wish to see it prosper and be happy.[915]

我研读大量历史，包括其中最黑暗、最糟粕的部分。即便如此，我依然热爱人类文明。正因如此，我心系人类成为多行星物种、发展太空文明——皆因我深爱人类文明。我祈愿见证人类繁荣昌盛，幸福安康。[915]

I'm troubled by the question, "Why have we not seen any aliens?" It could be because intelligence, or even just life, is incredibly rare. Maybe we're the only life in this galaxy. We should do everything possible to ensure this tiny candle of consciousness does not go out.[916]

我常忧思：'为何未见外星文明踪迹？'或许智慧生命本就极其稀有，甚至生命本身都是宇宙奇迹。也许我们就是银河系中唯一的生命。我们当竭尽所能，守护这微弱的意识烛火永不熄灭。[916]

Life on Earth hasn't been around very long, and it can easily disappear. Clearly, we need to extend life beyond Earth and become a multiplanet species.[917]

地球生命历史不过弹指一瞬，随时可能湮灭。显然，我们必须将生命延续至地球之外，蜕变为多行星物种。[917]

> If we make life multiplanetary, there may come a day when some plants and animals die out on Earth but are

更多资源 https://mirrorsite.org

> still alive on Mars.[918]
>
> 若实现多行星化，终有一日地球某些动植物灭绝时，火星之上它们仍将生生不息。[918]

Q: Wouldn't it be better to use all these resources and try to resolve problems on Earth?[919]

问：将所有资源用于应对地球上的问题不是更好吗？[919]

About half my money is dedicated to help solve problems like climate change on Earth and half to help establish a self-sustaining city on Mars to ensure the continuation of life of all species.[920]

我约半数的资金用于解决地球上的气候变化等问题，另一半则用于在火星上建立自我维持的城市，以确保所有物种生命的延续。[920]

The point is not to move from Earth to another planet and let Earth die. That's not what I'm saying at all.[921]

重点不是放弃地球移居其他星球任其消亡。这完全不是我的主张。[921]

To put this into perspective, the amount of resources I'm talking about for making life multiplanetary would be much less than 1 percent of all resources on Earth.[922]

从资源占比来看，实现多行星化所需投入仅占地球总资源的不到1%。[922]

Think of it as resource allocation. Do you think it's worth spending half a percent of Earth's resources to ensure we extend consciousness to Mars and other planets, so that no single event can be the end of our civilization?[923]

更多资源 https://mirrorsite.org

将其视为资源配置即可。你们认为投入地球资源的0.5%来确保将人类文明拓展至火星及其他星球，使单一事件无法终结我们的文明，是否值得？[923]

Redundancy of life is the defensive reason to go to Mars. But also, going to Mars is the grandest adventure I could possibly imagine. I can't think of anything more exciting, more fun, and more inspiring for the future than to have a base on Mars.

火星生命备份是防御性理由。但登陆火星也是我能想象的最宏伟冒险。我想不到比在火星建立基地更令人兴奋、更有趣、更能激发未来灵感的壮举了。

Great and terrible things will happen along the way, just as they happened in the creation of the United States. It will be difficult, and some people will probably die. But it will be incredibly inspiring.

沿途将见证伟大成就与严峻挑战，正如美国创建时期那样。过程充满艰辛，甚至可能有人牺牲。但这将成为不可思议的激励源泉。

Ultimately, if you care about life on Earth, you should want that life to become multiplanetary and ultimately multistellar. Otherwise you're signing the death warrant for all life as we know it. It's inevitable.[924]

归根结底，若你珍视地球生命，就该推动生命实现多行星化并最终迈向星际化。否则无异于签署所有已知生命的死亡判决书。这是必然结局。[924]

> Think of us being a multiplanet species as taking out insurance for life itself.
>
> 成为多行星物种，就是为生命本身购买的终极保险。

更多资源 https://mirrorsite.org

Life insurance, for life.[925]

生命的人寿保险，为存在护航。[925]

更多资源 https://mirrorsite.org

THE GATEWAY TO MARS

火星之门

What started off as basically a sandbar in the middle of nowhere is now Starbase, Texas. We named it “The Gateway to Mars,” because this is where we’re going to develop the technology necessary to take humanity, civilization, and life as we know it to another planet for the first time in the 4.5-billion-year history of Earth.[926]

这片德克萨斯州的星舰基地，从最初荒芜沙洲蜕变为'火星之门'。我们将在此开发关键技术，实现45亿年地球史上首次将人类、文明及已知生命送往异星的创举。[926]

Q: Why Mars?[927]

问：为何选择火星？[927]

There are not a lot of options, frankly. Venus is a superheated, high-pressure acid bath. Venus is hell, almost literally.[928] The moon is closer but it doesn’t have an atmosphere, has only one-sixth of Earth’s gravity, and is missing many key resources.[929] Plus, a Mars base is more likely to survive a conflict on Earth than a moon base.[930]

There are not a lot of options, frankly. Venus is a superheated, high-pressure acid bath. Venus is hell, almost literally. | 坦白说，可行的选择并不多。金星是个超高温的高压酸池。金星几乎就是地狱的真实写照。[928] The moon is closer but it doesn’t have an atmosphere, has only one-sixth of Earth’s gravity, and is missing many key resources. | 月球更近，但它没有大气层，重力只有地球的六分之一，且缺乏多种关键资源。[929] 此外，火星基地比月球基地更有可能在地球冲突中幸存。[930]

更多资源 https://mirrorsite.org

We could establish a crude permanent base on the moon. That would be the next step up from Apollo. Let's not just go there for a few hours and head back; let's have an occupied science base on the moon. We could build epic telescopes on the moon. They would enable us to see what's going on out there. Maybe we would detect those aliens![931]

我们可以在月球建立简易永久基地。这将是阿波罗计划之后的升级行动——我们不应仅停留数小时就返航；而应在月球建立常驻科学基地。我们能在月球建造巨型望远镜。它们将使我们得以观测深空动态。或许我们能探测到那些外星人！[931]

When we're out there exploring the galaxy, we might find a whole bunch of dead one-planet civilizations. They just never made it to the next planet. Can you imagine doing archaeology on strange ghost-town planets?![932]

当我们在银河系中探索时，可能会发现大量消亡的单一-星球文明。它们终究未能成功抵达下一颗行星。你能想象在陌生的废弃-行星上进行考古吗？！[932]

Progress is measured by the timeline to establish a self-sustaining civilization on Mars. That's how we gauge our progress at Starbase.[933]

衡量进度的标准是在火星建立自我-维持文明的时间表。这就是我们在星舰基地衡量进度的方式。[933]

> Occupy Mars, man.[934]
>
> 火星，人类必达之地。[934]

Q: How can we actually get enough stuff to Mars to build a city?

问：我们如何真正将足够物资运抵火星建造城市？

更多资源 https://mirrorsite.org

We're now at the point where we can produce a Starship roughly every two or three weeks. Now, we don't always produce a ship every two or three weeks because we are still making design upgrades. But ultimately we're aiming for the ability to produce a thousand ships a year.[935]

我们现在已能做到每两到三周生产一艘星舰。当然，我们并非总能保持这个生产节奏，因为仍在持续进行设计升级。但我们的终极目标是实现年产千艘星舰的能力。[935]

Starbase will probably be making as many Starships for Mars as Boeing and Airbus make commercial airplanes each year. This is really an enormous scale of manufacturing, because each Starship is bigger than a 747 or an A380.

星舰基地每年为火星建造的星舰数量，或将媲美波音和空客商用飞机的年产量。这确实是前所未有的制造规模——每艘星舰的体积都超越747或A380客机。

Tesla and other car companies are still building far higher volumes of complex manufactured tonnage than SpaceX. That is a way of saying it's achievable. These numbers are insanely high by traditional space standards but they are achievable, because they have been achieved in other industries.[936]

特斯拉等车企制造的复杂工业产品吨位远超太空探索技术公司，这证明我们的目标切实可行。这些数字在传统航天领域堪称惊人，但完全可实现，因为其他行业已有成功先例。[936]

> Starship is the key to preserving the light of consciousness. That's what it's all about.
>
> 星舰是守护意识之光的关键。此即核心要义。

更多资源 https://mirrorsite.org

> It may end up being the most important thing that we ever do.[937]
>
> 这终将成为我们最具历史意义的壮举。[937]

We're hoping to increase the cadence of flights to Mars dramatically with every launch window. Roughly every two years we will dramatically increase the number of ships that go to Mars. Ultimately we will try to get to one thousand or two thousand ships per Mars rendezvous.[938]

我们计划借每个火星发射窗口期，大幅提升前往火星的飞行频次。约每隔两年，我们将成倍增加赴火星的星舰数量，最终力争实现每次火星交汇窗口发射上千艘星舰的规模。[938]

We'll need to do a lot of orbital refueling. Orbiting rocket tanker ships will replenish the propellant of the ships that will actually go to Mars. We're aiming to demonstrate ship-to-ship propellant transfer. It's hard to make this not look a bit naughty because it's two ships connecting and doing a fluid transfer.

我们需要进行大量轨道推进剂加注操作。在轨运行的火箭加油船将为实际前往火星的飞船补充推进剂。我们的目标是演示星舰间推进剂传输。这很难避免显得不够雅观，因为这是两艘飞船对接并进行流体传输。

We would create a propellant depot ship that would look like a huge hot dog. Shortly before going to Mars, Starships would take off with a couple hundred tons of payload from Earth. They would reach orbit with almost no propellant left, then get refilled by the tanker for the journey to Mars.[939]

我们将建造外形酷似巨型热狗的推进剂储备船。在启程火星前不久，星舰将携带数百吨有效载荷从地球起飞。它们入轨时推进剂几近耗尽，随后由加油船完成燃料加注以执行火星任务。[939]

更多资源 https://mirrorsite.org

We need roughly ten thousand missions to get to a million tons transferred to Mars. We think we can do this by 2044.[940] My guess is that it will require about a million tons to build a self-sufficient city, but it might be ten million tons. I hope it's not one hundred million tons. That'd be a lot.[941]

We need roughly ten thousand missions to get to a million tons transferred to Mars. We think we can do this by 2044. | 需要约一万次飞行任务才能向火星转移百万吨物资。我们预计2044年前可实现此目标。[940] 我估计建造自给自足的城市需约百万吨物资，但也可能需要千万吨级规模。希望不是一亿吨。那可就太多了。[941]

Starship in its final form will probably do well over two hundred tons to orbit each flight, with full reusability and the ability to fly multiple times a day. We plan to launch about five uncrewed Starships to Mars in 2026. If those all land safely, then crewed missions are possible in 2028. If we encounter challenges, the crewed missions will be postponed two more years.

最终形态的星舰在完全可重用且能一天多次飞行的情况下，每次任务很可能向轨道运送超过两百吨载荷。我们计划在2026年发射约五艘无人星舰前往火星。若全部安全着陆，则2028年可实现载人任务。若遇挑战，载人任务将再推迟两年。

It is only possible to travel from Earth to Mars every two years when the planets are aligned. If Mars is on the other side of the sun, you can't get there. Can't go through the sun.[942] This increases the difficulty but also serves to immunize Mars from many catastrophic events on Earth.

It is only possible to travel from Earth to Mars every two years when the planets are aligned. If Mars is on the other side of the sun, you can't get there. Can't go through the sun. | 地球与火星间的航行仅能每隔两年行星排列成行时进行。若火星处于太阳另一侧，则无法抵达。无法穿越太阳。[942] 这虽增加难度，却使火星免受地球上诸多灾难性事件影响。

SpaceX will increase the number of spaceships traveling to Mars exponentially with every opportunity. We want to enable anyone who wants

更多资源 https://mirrorsite.org

to be a space traveler and go to Mars. That means you, your family, or friends—anyone who dreams of great adventure.[943]

太空探索技术公司将利用每次发射窗口，使前往火星的星舰数量成倍增长。我们致力于让所有向往成为太空旅行者、前往火星的人梦想成真——无论您、家人或朋友，任何渴望伟大冒险的人。[943]

We want to get to the point where we're sending over a million tons at every Mars transfer window. Then we're a serious civilization. A megaton per transfer window. We can't fly there continuously, so we'd have a gathering of a thousand ships or more.[944]

我们的目标是实现每次火星转移窗口期运送超过一百万吨物资的能力。那样我们才算真正意义上的文明。每个转移窗口期百万吨级的运输量。我们无法持续飞行，因此需要集结上千艘乃至更多的飞船。[944]

Eventually, there will be thousands of Starships going to Mars. Imagine an armada of Starships waiting in orbit for the planets to align and then this gigantic Starfleet taking off for Mars.[945] It will be a glorious sight to see! Can you imagine?[946]

Eventually, there will be thousands of Starships going to Mars. Imagine an armada of Starships waiting in orbit for the planets to align and then this gigantic Starfleet taking off for Mars. | 最终将会有成千上万的星舰前往火星。想象一支星舰舰队在轨道上等待行星排列就位，随后这支庞大的星际舰队启程奔赴火星的壮观景象。[945] 那将是何等辉煌的景象！你能想象吗？[946]

This is an extremely difficult engineering problem. But no new physics is required.[947]

这是个极其复杂的工程学难题。但无需新的物理学理论支撑。[947]

更多资源 https://mirrorsite.org

Q: What's the math on the journey to Mars?

问：前往火星的航行涉及哪些数学计算？

The fundamental optimization is minimizing cost per ton to orbit, and ultimately cost per ton to the surface of Mars. This may seem like a purely mercantile objective, but it is actually the thing that needs to be optimized. There is a certain cost per ton to the surface of Mars where we can afford to establish a self-sustaining city. If we don't get the cost down, we can't afford to do it.

核心优化目标是最大限度降低每吨物资的轨道运输成本，最终实现每吨物资火星着陆成本的最小化。这看似纯粹的商业考量，实则正是必须优化的关键指标。当火星表面每吨物资运输成本达到特定阈值时，我们才有能力建立自给自足的城市。若无法降低成本，我们将无力承担这项计划。

It will cost maybe a quarter of a percent or half a percent of gross domestic product (GDP). That is palatable. A few people going to Mars will not cause some meaningful drop in the standard of living.[948] For less than 1 percent of GDP, we can buy life insurance.[949]

It will cost maybe a quarter of a percent or half a percent of gross domestic product (GDP). That is palatable. A few people going to Mars will not cause some meaningful drop in the standard of living. | 成本可能仅占国内生产总值(GDP)的0.25%至0.5%，完全在可承受范围内。少数人前往火星不会导致生活水平显著下降。[948] 以不足GDP百分之一的投入，我们就能为文明购买生命保险。[949]

> Starlink internet is what's being used to pay for humanity getting to Mars. I would like to thank everyone who has bought Starlink because you're helping secure the future of civilization.

更多资源 https://mirrorsite.org

星链互联网服务正是资助人类登陆火星的支柱。感谢所有星链用户，你们正在助力守护文明的未来。

Thank you.[950]

谢谢[950]

Right now, you couldn’t fly to Mars for a trillion dollars. No amount of money could get any human a ticket to Mars. First, we need to make this possible. But we don’t just want to have flags and footprints on Mars for fifty years, like we did with the moon. To pass the great filter of existing only on one planet, we need to truly become a multiplanet species.[951]

即便耗资万亿美元，现今仍无法实现火星航行。无论多少金钱都无法换取火星船票。首要任务是让星际航行成为可能。我们不愿重蹈月球登陆覆辙——五十年后火星仅存旗帜与脚印。要突破单一行星的大过滤器桎梏，人类必须真正成为跨行星物种。[951]

更多资源 https://mirrorsite.org

BUILDING THE NEW WORLD

建设新世界

> Attendance is not mandatory here. It'll be dangerous and people might die.
>
> 此处出勤非强制要求。这很危险，可能会有人丧生。

Few people will want to go to Mars in the beginning. But for some, the excitement of the frontier exceeds the concern of danger.[952] I think it would be *the* adventure—the best adventure one could possibly go on—to go build a new civilization on a new planet.[953]

Few people will want to go to Mars in the beginning. But for some, the excitement of the frontier exceeds the concern of danger. | 最初愿意前往火星的人会很少。但对某些人而言，开拓边疆的兴奋感会超越对危险的顾虑。[952] 我认为在另一个星球建设新文明，就是最伟大的冒险——人类可能经历的最佳冒险。[953]

Some people seem to think this will be an escape hatch, some luxury resort for rich people. It is not. It's a high probability of death relative to Earth. Long journey. Not great food. A lot of hard work.[954]

有人觉得火星会是逃生舱口，或是富人的豪华度假村。并非如此。相比地球，那里死亡概率极高。旅程漫长，饮食简陋，还需大量艰苦劳作。[954]

You have to spend six months on a rocket with a hundred other people. It will be cramped. Like old ocean voyages, six months packed on a little ship

更多资源 https://mirrorsite.org

in the middle of the ocean.[955]

你必须在火箭上与上百人共处六个月，空间将十分拥挤。就像古老的航海旅程，在汪洋中的小船里挤上六个月。[955]

It’s going to take a while to build a real civilization on Mars. The critical threshold is if the ships from Earth stop coming for any reason, does the Mars City die out or not? That’s a high bar. You can’t be missing anything.[956]

在火星建立真正的文明需要时间。关键门槛在于：若地球飞船因故停航，火星城能否存续？这门槛很高，容不得任何缺失。[956]

Imagine you’re on a long sea voyage and the only thing you’re missing is vitamin C. It’s only a matter of time before it’s curtains. You’ve got to have all the things necessary to sustain civilization on Mars, including about a million people.[957]

设想你正进行远洋航行，唯一缺乏的是维生素C。时日无多只是时间问题。必须配备维系火星文明的全部要素，包括约一百万人口。[957]

> I would like to die on Mars…just not on impact.[958]
>
> 我愿在火星终老…但非因撞击而亡。[958]

Some Starships could come back to Earth. We want to offer an option of coming back, but most people who go to Mars will probably never come back to Earth.[959]

部分星舰可返回地球。我们提供返航选择，但多数火星移民可能永不再返地球。[959]

更多资源 https://mirrorsite.org

Most of the ships we send will probably stay there, especially while colonizing Mars, because the ship itself will be so valuable there. Martians will take apart the ship and use it for raw materials.[960]

我们派遣的大部分飞船或将常驻火星，尤其在殖民阶段，因为飞船本身在当地极具价值。火星居民将拆解飞船获取原材料。[960]

Once we get to Mars, there will be a lot to do, and it'll take a while to build it all. We have to build out the industrial base, then the city. First, we build a giant solar panel farm to generate energy. Then a facility to make fuel, oxygen to grow plants for food, and everything necessary to support life.[961]

抵达火星后将面临繁重建设任务。需先构建工业基础，再扩建城市。首先建造大型太阳能板阵列发电。随后建立燃料制造厂、制氧设施、作物种植区等全套生命维持系统。[961]

Ultimately we'll need all these things: power generation, ice mining, mining in general, propellent production, long-duration life support, construction, and global communication.[962]

最终我们将需要所有这些设施：发电、冰矿开采、综合采矿、推进剂生产、长期生命维持系统、基建工程以及全球通信网络。[962]

A fuel plant will create the fuel for the return trips of many Starships. It's mostly going to be oxygen plants, because rockets run on 78 percent liquid oxygen, 22 percent fuel. Mars has a CO2 atmosphere and water ice, which is CO2 plus H2O, so plenty of raw material to make what rockets need: CH4 (methane) and O22 (oxygen). Rocket fuel is easy to create on Mars, and in many other parts of the solar system.[963]

燃料工厂将为多艘星舰的返航制造燃料。主要设施将是氧气工厂，因为火箭燃料由78%液氧和22%推进剂组成。火星拥有二氧化碳大气层和水冰，即CO2与H2O的化合物，因此存在大量制造火箭所需原料：CH4（甲烷）与O22（氧）。 在火星及太阳系诸多其他区域，火箭燃料的制备都相对简便。[963]

更多资源 https://mirrorsite.org

> In the beginning, people would live in glass domes. Over time, we'd terraform Mars and make it like Earth.[964]
>
> 初期阶段，人类将居住于玻璃穹顶之中。随着时间的推移，我们将实施环境地球化改造，使火星趋近地球形态。[964]

Mars is cold, but if we warm it up we'll get liquid water. Mars would have an ocean roughly a mile deep on 40 percent of the planet once we warm it up. That's a lot of water. A lot of the ice you see on the poles is actually dry ice. It's frozen CO2.[965]

火星气候寒冷，但若我们将其加热，即可获得液态水。火星升温后，40%的区域将形成深约1.6公里的海洋，水资源储量极为可观。极地所见冰层多为干冰，实为冻结的二氧化碳。[965]

Terraforming Mars mostly consists of warming it up. We could warm it up either with solar reflectors in orbit or a lot of thermonuclear explosions.[966]

火星地球化改造的核心在于升温，可通过轨道部署太阳反射镜或实施大规模热核爆炸实现。[966]

It sounds crazy, but a series of thermonuclear explosions basically creates an artificial sun. If you're worried that it will generate dangerous radiation, have you stood in the sun? The sun is a giant thermonuclear reactor. Obviously we can stand in front of the sun and not die. We could launch a missile every ten seconds or so. It would be like gigantic thermonuclear fireworks.[967]

虽似天方夜谭，但系列热核爆炸将形成人造太阳。若担忧辐射危害，何不审视日常沐浴日光之实？太阳本质即是巨型热核反应堆。人类直面日光尚能存活乃不争事实。以每秒十枚的频次发射导弹，其效宛若引爆巨型热核烟花。[967]

更多资源 https://mirrorsite.org

> We’d create two little suns, pulsing above the north and south poles.
>
> 两极上空将浮现脉动光球，宛若微型人造太阳。

That would warm the poles up enough that the frozen carbon dioxide (CO2) would gasify. The Martian atmosphere would get more dense, with water vapor and CO2 in the air. In Mars’s case, more CO2 in the air is good, because it will create a positive cycle to make it warmer with more liquid water—like Earth’s environment.[968]

极地温度提升将促使固态二氧化碳充分气化。火星大气将变得更稠密，空气中含有水蒸气和二氧化碳。对火星而言，大气中二氧化碳增多是好事，这将形成良性循环：温度升高产生更多液态水——最终形成类似地球的环境。[968]

> Even if you don’t go to Mars, you can watch this all happen on TV. It’ll be so cool.[969]
>
> 即便你不去火星，也能在电视上见证这一切。那场景会酷极了。[969]

What I’m describing may sound crazy, but it is a small fraction of what will ultimately be done, as long as we become a two-planet civilization. Look at the history of shipping technology in Europe. When all you had to do was cross the Mediterranean, the ships were pretty lame—they only had short-range vessels, which couldn’t cross the Atlantic.

我的描述听起来或许疯狂，但只要人类成为双行星文明，这些设想最终只会实现极小部分。回顾欧洲航运技术史：当航行只需横跨地中海时，船只相当简陋——仅有短途船只，这些船只无法横渡大西洋。

更多资源 https://mirrorsite.org

Without the forcing function of long-range commerce, shipping technology didn't improve much. You could do mostly the same things with ships around the time of Julius Caesar and the time of Columbus. Fifteen hundred years later, ships could still only cross the Mediterranean. But as soon as there was a *reason* to cross the Atlantic, shipping technology improved dramatically. The American colonies were needed for that to happen.[970]

若缺乏长距离贸易的驱动，航运技术便难以取得重大进步。在尤利乌斯·凯撒时期与哥伦布时期，船舶的功能几乎相差无几。一千五百年后，船只依然只能在地中海航行。但当出现需要横跨大西洋的需求时，航运技术便突飞猛进。正是北美殖民地的开拓需求推动了这一变革。[970]

> Reusable rockets are the modern-day equivalent of the first ships that could cross oceans.
>
> 可重复使用火箭就如同现代版的首批远洋航船。
>
> Until you have a breakthrough technology enabling travel, there's no way for entrepreneurial energy to do anything.
>
> 在突破性航行技术出现之前，企业家精神能量无处施展。

Once we build reusable rockets, suddenly the opportunity is immense. We're going to do our best to get you to Mars, and make sure there's an environment there where entrepreneurs can continue building and flourish.[971]

可重复使用火箭一旦问世，机遇便将呈几何级增长。我们将全力助你登陆火星，并打造能让企业家持续建设繁荣发展的生态环境。[971]

更多资源 https://mirrorsite.org

The same thing happened with the first cross-continental railroad in the United States, the Union Pacific Railroad. When they were building the Union Pacific Railroad, nobody could predict Silicon Valley, Hollywood, or California becoming the most populous state in the country. That would have sounded crazy. But then they discovered gold.[972]

美国首条横贯大陆铁路——太平洋联合铁路的修建亦是如此。当年施工之际，无人能预见硅谷的崛起、好莱坞的兴盛，更无法预见加利福尼亚州会成为美国人口第一大州。那听起来会显得疯狂。但随后他们发现了黄金。[972]

> It’s incumbent on SpaceX and other organizations to figure out how to get to Mars. Otherwise, nothing else matters.
>
> 太空探索技术公司及其他机构责无旁贷，必须解决如何抵达火星的问题。否则其他一切都将失去意义。
>
> Once we get there, there’s a lot that can be done.[973]
>
> 一旦抵达火星，我们将大有可为。[973]

There will be a lot of super exciting things that are hard to predict. After the basic infrastructure is built on Mars, there will be an explosion of opportunity for entrepreneurs, because our new world will need everything from iron foundries to pizza joints. This includes everything you can imagine, like starting the first Italian restaurant on Mars. That would be cool, and somebody’s gotta do it.[974]

未来必将涌现诸多难以预料的激动人心之事。火星基础建设完成后，企业家群体将迎来机遇爆发期——新世界需要从钢铁厂到披萨店的一

更多资源 https://mirrorsite.org

切设施。这包括所有你能想象的事物，例如开设火星首家意大利餐厅。这很酷，总得有人去实现。[974]

更多资源 https://mirrorsite.org

COLONIZING THE GALAXY

殖民银河系

> Earth is the cradle of humanity. We cannot stay in the cradle forever.
>
> 地球是人类文明的摇篮。我们不可能永远待在摇篮里。
>
> It is time to go forth, be out there among the stars. Expand the scope and scale of human consciousness.[975]
>
> 是时候启程，置身于星辰之间了。拓展人类意识的广度与深度。[975]

The big picture isn't just to back up the hard drive of humanity, but to grow humanity into a true multiplanetary species. Let's establish a regular cargo route to Mars. With the economic driver of interplanetary commerce, there will be resources and incentives to massively improve space transport technology, and then things will go to a whole new level.[976]

宏大愿景不仅在于备份人类文明数据，更要推动人类成为真正的多行星物种。让我们建立通往火星的常规货物航线。凭借星际贸易的经济驱动力，我们将获得资源和激励来大规模改进太空运输技术，从而将一切推向全新高度。[976]

Starship is not suitable for going to another star system, but it is a general solution for transport anywhere inside the solar system. Once we have a propellant depot on Mars, we can travel to the asteroid belt, the moons of

更多资源 https://mirrorsite.org

Jupiter and Saturn, and ultimately anywhere in the solar system. This is huge.[977]

星舰虽不适用于其他恒星系统，但它是太阳系内全域运输的通用解决方案。在火星建立推进剂存储基地后，我们便可前往小行星带、木星与土星的卫星，最终抵达太阳系内任何区域。此举意义重大。[977]

> When space travel becomes as common as air travel, the future of civilization will be assured.
>
> 当太空旅行如同航空旅行般普及时，文明的未来方有保障。

One way to look at the progress of civilization is the percentage completion of each Kardashev level. Kardashev level one is harnessing all the energy of a planet. In my opinion, we've only harnessed maybe 1 or 2 percent of Earth's energy. So we've got a long way to go to complete Kardashev level one.

衡量文明进步的一种方式，是观察各卡尔达肖夫等级的完成百分比。卡尔达肖夫一级标准是充分开发整个行星的能源。依我之见，我们仅开发了地球约1%至2%的能源。因此，要实现卡尔达肖夫一级目标，我们仍有漫长征程。

Kardashev level two is complete when we've harnessed all the energy of the sun. That would be—I don't know—a billion times more energy than Earth? Maybe closer to a trillion.

当我们能利用太阳的全部能量时，就实现了卡尔达肖夫二级文明。这相当于——大概——比地球现有能源高出十亿倍的能量？可能接近万亿倍。

Then, Kardashev level three would be all the energy of a galaxy. We're pretty far from that. So we're at the very, very early stage of the intelligence

更多资源 https://mirrorsite.org

big bang.[978]

而卡尔达肖夫三级文明将掌握整个银河系的能量。我们离这个目标还相当遥远。所以我们正处于智能大爆炸的极早期阶段。[978]

If we can establish a Mars colony, we can almost certainly colonize the whole solar system. We'll go to the moons of Jupiter, at least some of the outer ones, probably Titan on Saturn, and the asteroids. Once we have an Earth-to-Mars economy as a forcing function, we'll cover the whole solar system.[979]

若能建立火星殖民地，我们几乎必然能殖民整个太阳系。我们将登陆木星的卫星——至少是部分外围卫星，可能还包括土星的泰坦星以及各类小行星。一旦形成地球-火星经济循环的强制驱动机制，整个太阳系都将被我们覆盖。[979]

We have to make Mars work. If we're going to have any chance of sending stuff to other star systems, we need to be laser-focused on Mars. That's our next step.[980]

我们必须让火星计划取得成功。若想获得向其他恒星系统输送物资的机会，就必须集中火力攻克火星，这是我们的下一步战略。[980]

On a galactic time scale, even with slower-than-light travel, we could colonize the whole galaxy. Even some of the neighboring galaxies. If we get a million years, even with no new physics, could we colonize the galaxy? Absolutely. The entire galaxy.[981]

在银河系的时间尺度上，即使采用亚光速旅行，我们也能殖民整个银河系。甚至包括部分邻近星系。若有百万年时间，即便没有新的物理突破，我们能否殖民银河系？毫无疑问。整个银河系。[981]

> You are the magicians of the twenty-first century; don't let anything hold you back.

更多资源 https://mirrorsite.org

你们是二十一世纪的魔法师；不要让任何事物束缚你们。

Imagination is the limit.

唯有想象力能限制你。

Go out there and create some magic.[982]

去施展魔法吧。[982]

898 *Return to Space*.

898 返回 太空。

899 “Elon Musk on His PayPal Firing,” Inc. 5000.

899 “埃隆·马斯克谈PayPal解雇事件”，公司5000。

900 Robert Strauss, “The Next, Next Thing,” *The Pennsylvania Gazette*, November 1, 2008, https://thepenngazette.com/the-next-next-thing/.

900 罗伯特·施特劳斯，“下一件大事”，宾夕法尼亚公报，2008年11月1日，https://thepenngazette.com/the-next-next-thing/。

901 “Elon Musk on His PayPal Firing,” Inc. 5000.

901 “埃隆·马斯克谈PayPal解雇事件”，公司5000。

902 Rogan and Musk, “JRE #1609.”

902 罗根与马斯克，《JRE第1609期》

903 “Elon Musk,” Full Send Podcast.

903 《埃隆·马斯克》，全力发送 播客

904 “Elon Musk,” Full Send Podcast.

904 《埃隆·马斯克》，全力发送 播客

更多资源 https://mirrorsite.org

905 Musk, “Caltech Commencement Speech.”

905 马斯克，《加州理工学院毕业典礼 演讲》

906 Lex Fridman and Elon Musk, “Elon Musk: Neuralink, AI, Autopilot, and the Pale Blue Dot | Lex Fridman Podcast #49,” Lex Fridman, November 12, 2019, YouTube video, 36:09, https://www.youtube.com/watch?v=smK9dgdTl40.

906 莱克斯·弗里德曼与埃隆·马斯克，《埃隆·马斯克：脑机接口、人工智能、自动驾驶与暗淡蓝点 | 莱克斯·弗里德曼播客#49》，莱克斯·弗里德曼，2019年11月12日，YouTube视频，36:09，https://www.youtube.com/watch?v=smK9dgdTl40。

907 Musk, “Caltech Commencement Speech.”

907 马斯克，《加州理工学院毕业典礼 演讲》。

908 Musk, “Caltech Commencement Speech.”

908 马斯克，《加州理工学院毕业典礼 演讲》。

909 Wilson and Musk, “Metaphysical Van.”

909 威尔逊与马斯克，《形 而上的车》。

910 Wilson and Musk, “Metaphysical Van.”

910 威尔逊与马斯克，《形 而上的车》。

911 “Elon Musk: 10X Every 6 Months.”

911 “埃隆·马斯克：每6 个月实现十倍增长。”

912 “Elon Musk: 10X Every 6 Months.”

912 “埃隆·马斯克：每6 个月实现十倍增长。”

913 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

913 可汗与马斯克，“特斯拉汽车公司和 太空探索技术公司首席执行官。”

914 Fridman and Musk, “Lex Fridman Podcast #252.”

914 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

915 Fridman and Musk, “Lex Fridman Podcast #252.”

915 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

916 “Elon Musk: Digital Superintelligence,” Y Combinator.

916 《埃隆·马斯克：数字超级智能》，Y Combinator。

更多资源 https://mirrorsite.org

917 *Return to Space*.

917 重返 太空领域。

918 Musk (@elonmusk), X account.

918 马斯克 (@elonmusk)，X 账号

919 “Elon Musk: 10X Every 6 Months.”

919 《埃隆·马斯克：每6 个月实现十倍增长》

920 Musk (@elonmusk), X account.

920 马斯克 (@elonmusk)，X 账号

921 “Elon Musk on How to Save the Human Race,” Milken Conference.

921 “埃隆·马斯克谈如何拯救人类”，米尔肯 会议。

922 “Elon Musk: 10X Every 6 Months.”

922 “埃隆·马斯克：每6 个月实现十倍增长”

923 “Elon Musk: 10X Every 6 Months.”

923 “埃隆·马斯克：每6 个月实现十倍增长”

924 Musk, “Caltech Commencement Speech.”

924 马斯克，《加州理工学院毕业典礼演讲》

925 Fridman and Musk, “Lex Fridman Podcast #252.”

925 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》

926 “Elon Musk SpaceX Update at Starbase,” May 2025.

926 《埃隆·马斯克太空探索技术公司星舰基地进展更新》，2025年5月

927 “Elon Musk SpaceX Update, Starship Flight 3.”

927 “埃隆·马斯克太空探索技术公司更新：星舰飞行 3”

928 “Elon Musk at TED2022.”

928 “埃隆·马斯克于 TED2022大会”

929 “Elon Musk SpaceX Update, Starship Flight 3.”

929 “埃隆·马斯克太空探索技术公司更新：星舰飞行 3”

更多资源 https://mirrorsite.org

930 “Elon Musk: 10X Every 6 Months.”

930 “埃隆·马斯克：每六个月实现十倍增长。”

931 Musk, “Caltech Commencement Speech.”

931 马斯克，“加州理工学院毕业典礼演讲。”

932 Rogan and Musk, “JRE #1609.”

932 罗根与马斯克，“JRE第1609期。”

933 “Elon Musk SpaceX Update at Starbase,” May 2025.

933 “埃隆·马斯克太空探索技术公司于星舰基地的更新，”2025年5月。

934 Fridman and Musk, “Lex Fridman Podcast #438.”

934 弗里德曼与马斯克，“《莱克斯·弗里德曼播客第438期》”。

935 “Elon Musk SpaceX Update at Starbase,” May 2025.

935 “埃隆·马斯克太空探索技术公司于星舰基地的更新，”2025年5月。

936 “Elon Musk SpaceX Update at Starbase,” May 2025.

936 “埃隆·马斯克太空探索技术公司星舰基地进展更新”，2025年5月 。

937 “Elon Musk SpaceX Update, Starship Flight 3.”

937 “埃隆·马斯克太空探索技术公司更新：星舰飞行 3号”

938 “Elon Musk SpaceX Update at Starbase,” May 2025.

938 “埃隆·马斯克太空探索技术公司星舰基地进展更新”，2025年5月 。

939 “Elon Musk SpaceX Update, Starship Flight 3.”

939 “埃隆·马斯克太空探索技术公司更新，星舰飞行 3号。”

940 “Elon Musk: 10X Every 6 Months.”

940 “埃隆·马斯克：每六个月实现 十倍增长。”

941 “Elon Musk SpaceX Update at Starbase,” May 2025.

941 “埃隆·马斯克在星舰基地的太空探索技术公司更新，”2025年 5月。

942 Musk and Altman, “Thinking for the Future.”

942 马斯克与阿尔特曼，《未来思考》

更多资源 https://mirrorsite.org

943 Musk (@elonmusk), X account.

943 马斯克（@elonmusk），X账号

944 “Elon Musk SpaceX Update at Starbase,” May 2025.

944 《埃隆·马斯克在星舰基地的太空探索技术公司更新》，2025年5月

945 “Elon Musk SpaceX Update, Starship Flight 3.”

945 "埃隆·马斯克 SpaceX 最新进展，星舰飞行 3。"

946 Musk (@elonmusk), X account.

946 马斯克 (@elonmusk)，X 账户。

947 Fridman and Musk, “Lex Fridman Podcast #252.”

947 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

948 Khan and Musk, “CEO of Tesla Motors and SpaceX.”

948 可汗与马斯克，《特斯拉汽车首席执行官与太空探索技术公司》

949 Urban, “SpaceX Will Colonize Mars, Part 2.”

949 厄本，《太空探索技术公司将殖民火星·第二部》

950 “Elon Musk SpaceX Update at Starbase,” May 2025.

950 《埃隆·马斯克于星舰基地发布太空探索技术公司更新》，2025年5月

951 “Elon Musk,” Full Send Podcast.

951 《埃隆·马斯克》，全方位播客

952 “Elon Musk Answers Your Questions,” SXSW 2018.

952 《埃隆·马斯克答网友问》，西南偏南大会 2018

953 “Elon Musk SpaceX Update at Starbase,” May 2025.

953 《埃隆·马斯克太空探索技术公司星舰基地进展更新》，2025年5月

954 Rogan and Musk, “JRE #1609.”

954 罗根与马斯克，《JRE第1609期》。

955 “Elon Musk,” Full Send Podcast.

955 《埃隆·马斯克》，Full Send 播客。

更多资源 https://mirrorsite.org

956 “Elon Musk,” Full Send Podcast.

956 《埃隆·马斯克》，Full Send 播客。

957 Rogan and Musk, “JRE #1609.”

957 罗根与马斯克，《JRE第1609期》。

958 “Jeff Skoll Talks with Elon and Kimbal Musk.”

958 "杰夫·斯科尔与埃隆和基姆巴尔·马斯克对话 "

959 “Elon Musk SpaceX Update, Starship Flight 3.”

959 "埃隆·马斯克太空探索技术公司最新进展：星舰飞行 3"

960 “Elon Musk SpaceX Update, Starship Flight 3.”

960 "埃隆·马斯克太空探索技术公司最新进展：星舰飞行 3"

961 Rogan and Musk, “JRE #1609.”

961 罗根与马斯克，《JRE第1609期》

962 “Elon Musk SpaceX Update, Starship Flight 3.”

962 《埃隆·马斯克太空探索技术公司更新：星舰飞行3号》

963 “Elon Musk at TED2022.”

963 《埃隆·马斯克在TED2022大会》

964 Rogan and Musk, “JRE #1609.”

964 罗根与马斯克，《JRE第1609期》

965 “Elon Musk,” Full Send Podcast.

965 「埃隆·马斯克」，Full Send播客节目

966 “Elon Musk's NEW EPIC Rant.”

966 「埃隆·马斯克的全新史诗级长篇大论」

967 “Elon Musk,” Full Send Podcast.

967 「埃隆·马斯克」，Full Send播客节目

968 Musk and Altman, “Thinking for the Future.”

968 马斯克和阿尔特曼，《为未来思考》。

更多资源 https://mirrorsite.org

969 “Elon Musk Answers Your Questions,” SXSW 2018.

969 "埃隆·马斯克回答你的问题"，西南偏南大会2018。

970 Tim Urban, “SpaceX’s Big F***ing Rocket: The Full Story,” *Wait But Why* (blog), September 29, 2016, https://waitbutwhy.com/2016/09/spacexs-big-fking-rocket-the-full-story.html.

970 蒂姆·厄本，"SpaceX的超大型火箭：完整故事"，《等等，但为什么》（博客），2016年9月29日，https://waitbutwhy.com/2016/09/spacexs-big-fking-rocket-the-full-story.html。

971 “Elon Musk Answers Your Questions,” SXSW 2018.

971 “埃隆·马斯克回答你的问题”，西南偏南大会 2018年。

972 Rogan and Musk, “JRE #1609.”

972 罗根与马斯克，《JRE第1609期》。

973 “Elon Musk's Vision for the Future.”

973 “埃隆·马斯克对未来的 展望”。

974 Urban, “SpaceX's Big F***ing Rocket.”

974 厄本，《太空探索技术公司的"超级大" 火箭》。

975 *Return to Space*.

975 重返 太空。

976 Urban, “SpaceX's Big F***ing Rocket.”

976 厄本，《太空探索技术公司的"超级大" 火箭》。

977 “Elon Musk at TED2022.”

977 “埃隆·马斯克在 TED2022。”

978 “Elon Musk: Digital Superintelligence,” Y Combinator.

978 “埃隆·马斯克：数字超级智能，” Y Combinator。

979 Urban, “SpaceX Will Colonize Mars, Part 2.”

979 厄本，“太空探索技术公司将殖民火星，部件 2。”

980 Urban, “SpaceX Will Colonize Mars, Part 2.”

980 厄本，《太空探索技术公司将殖民火星，部件 2》

981 Rogan and Musk, “JRE #1609.”

更多资源 https://mirrorsite.org

981 罗根与马斯克，《JRE第1609期》

982 Musk, “Caltech Commencement Speech.”

982 马斯克，《加州理工学院毕业典礼 演讲》

更多资源 https://mirrorsite.org

BONUS

附加原则

更多资源 https://mirrorsite.org

THE 69 CORE MUSK METHODS

69项**核心马斯克法则**

These were selected as some of the fundamental ideas that make Elon and his companies successful. They have been edited or paraphrased into short, memorable maxims.

这些理念被选出作为埃隆及其公司获得成功的基础思想它们经过编辑或转述，形成简短易记的格言

1. You are capable of more than you think.
1. 你的潜力远超想象
2. It’s possible for ordinary people to choose to be extraordinary.
3. 普通人也能选择成为非凡者
4. You can teach yourself anything. Read widely; talk to experts.
5. 你能自学任何知识：广泛阅读，请教专家
6. Assume you’re wrong. Aspire to be less wrong.
7. 先假设自己是错的，再追求减少错误
8. Internalize responsibility.
9. 将责任内化于心
10. If we don’t make stuff, there is no stuff.
11. 不制造产品，就没有产品
12. Creating products and services creates wealth.
13. 创造产品与服务即是创造财富
14. A useful life is worth having lived.

更多资源 https://mirrorsite.org

15. 创造价值的人生才值得活过。
16. Don’t aspire to glory; aspire to work.
17. 莫求虚名，但求实干
18. Take actions that increase the odds of the future being good.
19. 采取行动提升未来向好的概率
20. Every day, we either increase the rate of innovation or it slows down.
21. 每日不进则退：要么加速创新，要么任其放缓
22. Work on what is just becoming possible.
23. 专注于那些刚刚成为可能的事物。
24. Don’t wait for the world to want it. If it should obviously exist, go build it.
25. 不要等待世界需要它。如果它显然应该存在，就去创造它。
26. Build what no one else is building.
27. 构建无人涉足的领域。
28. As you move forward, allies will assemble around you.
29. 当你前行时，志同道合者将汇聚在你周围。
30. Prototypes are proof.
31. 原型即证明。
32. Start somewhere, question assumptions, and adapt to reality.
33. 从某处开始，质疑假设，并适应现实。
34. Reason from fundamentals, not from what others are doing.
35. 从基本原理出发推理，而非效仿他人所为。
36. “The magic-wand number.” See the theoretically perfect and work toward it.
37. 「魔杖-数字」。瞄准理论上的完美状态并为之努力。
38. “Know the idiot index.” Understand the cost of components.
39. 「了解白痴指数」。掌握零部件的真实成本。
40. The Algorithm: Question Requirements → Try to Delete the Part or Process → Simplify → Accelerate → Automate.
41. 算法之道：质疑需求 → 尝试删除部件或流程 → 简化 → 加速 → 自动化。
42. For critical items, have meetings every twenty-four hours to run The Algorithm and check progress from yesterday.

更多资源 https://mirrorsite.org

43. 对于关键事项，每24小时召开会议执行算法之道，并检查昨日进展。
44. Stay as close to the actual work as possible. Do not separate yourself from the pain of your decisions.
45. 尽可能贴近实际工作。不要让自己远离决策带来的痛苦。
46. All requirements should be treated as recommendations.
47. 所有要求都应视为建议。
48. The only fixed laws are the laws of physics.
49. 唯一不变的定律是物理学定律。
50. The best part is no part; the best process is no process.
51. 最佳部件是无部件；最佳流程是无流程。
52. Simplicity creates both reliability and low cost.
53. 简约造就可靠性与低成本。
54. Find the design necessity of every part and every process.
55. 为每个部件和每道工序确立设计必要性。
56. Overdelete and add back the absolutely necessary.
57. 先过度删减，再补回绝对必要项。
58. Push for radical breakthroughs.
59. 追求重大突破。
60. Be proactive. You will never win unless you take charge of setting the strategy.
61. 主动出击。不主导制定战略就永远无法获胜。
62. A maniacal sense of urgency is our operating principle.
63. 极度紧迫感是我们的运营准则。
64. A factory moving at twice the speed of another factory is basically equivalent to two factories.
65. 以两倍速运转的工厂本质上等同于两家工厂。
66. Attack the bottleneck. If you have 9,999 things that are working and one that isn’t, that one sets the overall production rate.
67. 攻克瓶颈环节。若9999个环节运作正常而一个环节停滞，该环节将决定整体生产效率。
68. You’ll move as fast as your least-lucky or least-competent supplier.
69. 你的进度取决于最不幸或最不靠谱的供应商。
70. Do things in parallel.

更多资源 https://mirrorsite.org

71. 并行推进事务。
72. Give teams one key metric to focus on. Video games without a score are boring.
73. 为团队设定单一核心指标。没有计分的电子游戏索然无味。
74. Separating design, engineering, and manufacturing is a recipe for dysfunction.
75. 设计、工程学与制造相分离，必然导致功能失调。
76. Speed of innovation is what matters.
77. 创新速度才是关键。
78. Beat competitors on speed, quality, and cost, not anticompetitive behavior.
79. 在速度、质量与成本上超越竞争者，而非采取反竞争行为。
80. Test the absurd. When something seems impossible, ask: “What would it take?”
81. 检验荒谬之事。当某事看似不可能时，追问：'实现它需要什么条件？'
82. Money is not the constraint. Exceptional engineers are.
83. 资金并非制约因素。卓越的工程师才是关键。
84. Get everyone thinking like the chief engineer.
85. 让全员具备总工程师思维。
86. Get a clear, direct feedback loop with reality.
87. 建立清晰直接的现实反馈回路。
88. Always be smashing your ego. Ensure ability > ego.
89. 持续破除自我意识。确保能力 > 自尊心。
90. Ask, “Is this effort resulting in a better product or service?” If not, stop.
91. 自问：'此努力是否使产品或服务更优？'若非，即刻停止。
92. Good taste is learnable. Train yourself to notice what makes something beautiful.
93. 卓越品味可习得。训练自己洞悉事物之美。
94. Physics doesn’t care about hurt feelings. Make the rocket fly.
95. 物理学不在乎受伤的感情。让火箭飞起来。
96. Empathy is not an asset.
97. 共情力并非资产。

更多资源 https://mirrorsite.org

98. Use simple, clear, humble terms.
99. 使用简洁、清晰、谦逊的表述。
100. Go directly to the source of information.
101. 直抵信息源头。
102. When hiring, look for evidence of exceptional ability.
103. 招聘时，寻求卓越能力的实证。
104. Combine engineering and financial fluency.
105. 融合工程学与财务敏锐度。
106. To truly lead the product, lead the company.
107. 要真正主导产品，需先领导公司。
108. Lead from the front. Sleep on the factory floor.
109. 身先士卒。睡在工厂车间。
110. Physically move yourself to wherever the problem is immediately.
111. 立即亲临问题现场。
112. All bad news should be given loudly and often. Good news can be said quietly and once.
113. 所有坏消息都应大声且频繁地传达。好消息只需轻声说一次足矣。
114. Failure is essentially irrelevant unless it is catastrophic.
115. 失败本质上无关紧要，除非是灾难性的。
116. Fear of failure is the biggest cause of failure.
117. 畏惧失败是失败的最大根源。
118. Feel the fear and do it anyway.
119. 直面恐惧，勇往直前。
120. Double down. Push your chips back in.
121. 加倍下注，押上所有筹码。
122. Work like hell. Like every waking hour. Go ultra hardcore.
123. 全力以赴，醒着的时间都在工作，投入极限硬核状态。
124. Make sure you really care about what you’re doing—and take the pain.
125. 确保你真正热爱所从事的事业——并甘愿承受痛苦。
126. We should not be afraid of doing something important just because some amount of tragedy is likely to occur.
127. 我们不该因为可能出现悲剧就畏惧重要事业。

更多资源 https://mirrorsite.org

128. When something is important enough, do it even if the odds are not in your favor.
129. 当事情足够重要时，即使胜算渺茫也要坚持到底。
130. Don’t ever give up. You’d have to be dead or completely incapacitated.
131. 永不放弃，除非死亡或完全丧失行动能力。
132. Play life like a game.
133. 把人生当作游戏。
134. Go ultra hardcore.
135. 投入极限硬核状态。
136. Humor is a differentiator.
137. 幽默感是差异化优势。

更多资源 https://mirrorsite.org

TIMELINE OF ELON MUSK

埃隆·马斯克年表

This is not comprehensive, and focuses on his entrepreneurial efforts. All ages are approximate.

本表非详尽记录，侧重其企业家历程。所有年龄均为约数。

- 1971—Born June 28; grew up in Pretoria, South Africa.[983]
- 1971—6月28日出生；在南非比勒陀利亚长大。[983]
- 1984 (AGE 12)—Created his first video game, called *Blast Star*.[984]
- 1984年（12岁）—创作首款电子游戏《*Blast Star*》。[984]
- 1989 (AGE 17)—Emigrated from South Africa to Canada, worked odd jobs on farms.[985]
- 1989年（17岁）—从南非移民加拿大，在农场打零工。[985]
- 1990 (AGE 18)—Attended Queen's University in Ontario.[986]
- 1990年（18岁）—就读安大略省女王大学。[986]
- 1992 (AGE 20)—Transferred to University of Pennsylvania, studied physics and engineering.[987]
- 1992年（20岁）—转学宾夕法尼亚大学，攻读物理学与工程学。[987]
- 1994 (AGE 23)—Completed two internships: Pinnacle research working on high energy density capacitors for electric cars,[988] and a video game company (ironically) called Rocket Science.[989]
- 1994 (AGE 23)—Completed two internships: Pinnacle research working on high energy density capacitors for electric cars, | 1994年（23岁）—完成两项实习：在Pinnacle研究所研发电动汽车用高能量密度电容

更多资源 https://mirrorsite.org

器，[988] 并加入名为'火箭科学'的游戏公司（公司名颇具讽刺意味）。[989]

- 1995 (AGE 24)—Moved to California. Enrolled in Stanford's physics PhD program, but deferred. Started Zip2, building software for maps, directories, and publishing online.[990]
- 1995年（24岁）—移居加利福尼亚州。入读斯坦福大学物理学博士项目，但选择延期入学。创立Zip2公司，开发用于地图、目录和在线发布的软件。[990]
- 1999 (AGE 28)—Sold Zip2 for $307 million cash to Compaq (who owned AltaVista). Personal proceeds of ~$22 million.[991]
- 1999年（28岁）——将Zip2公司以3.07亿美元现金出售给康柏公司（该公司拥有AltaVista）。个人收益约2200万美元。[991]
- 1999 (AGE 28)—Started X.com, investing $12 million of his money.[992]
- 1999年（28岁）——投资1200万美元个人资金创立X.com。[992]
- 2000 (AGE 29)—X.com merged with Confinity (founded by Peter Thiel, Max Levchin, and Luke Nosek) to form PayPal.[993]
- 2000年（29岁）——X.com与康菲尼迪公司（由彼得·蒂尔、马克斯·列夫琴和卢克·诺塞克创立）并购，合并成立PayPal。[993]
- 2001 (AGE 30)—Contracted malaria while on a safari in South Africa. Almost died.[994]
- 2001年（30岁）——在南非游猎之旅期间感染疟疾，几乎丧命。[994]
- 2002 (AGE 31)—Sold PayPal to eBay for $1.5 billion. Personal proceeds after tax were ~$170million.[995] Founded SpaceX.[996]
- 2002 (AGE 31)—Sold PayPal to eBay for $1.5 billion. Personal proceeds after tax were ~$170million. | 2002年（31岁）——将PayPal以15亿美元出售给eBay。 个人税后所得款项约为1.7亿美元。[995] 创立太空探索技术公司。[996]
- 2004 (AGE 33)—Invested $6.5 million in Tesla Motors, leading the Series A.[997]
- 2004年（33岁）——向特斯拉汽车公司投资650万美元，主导A轮融资。[997]
- 2005 (AGE 34)—Invested millions more into Tesla Motors, leading the Series B.[998]

更多资源 https://mirrorsite.org

- 2005年（34岁）——向特斯拉汽车公司追加投资数百万美元，主导B轮融资。[998]
- 2006 (AGE 35)—Invested more millions into Tesla Motors, coleading Series C.[999]
- 2006年（35岁）——向特斯拉汽车公司继续投资数百万美元，联合主导C轮融资。[999]
- 2008 (AGE 37)—Falcon becomes the first privately developed rocket to reach orbit.[1000]
- 2008年（37岁）——猎鹰成为首枚进入轨道的私营研发火箭。[1000]
- 2008 (AGE 37)—Invested more than $15 million, the remainder of his net worth, into Tesla Motors, leading the Series D. Became CEO of Tesla.[1001]
- 2008年（37岁）——向特斯拉汽车公司投资超过1500万美元（其净资产剩余部分），主导D轮融资。成为特斯拉首席执行官。[1001]
- 2012 (AGE 41)—First sale of the new Tesla Model S.[1002]
- 2012年（41岁）——新款特斯拉Model S实现首次发售。[1002]
- 2014 (AGE 43)—Co-founded Astra Nova, an online nonprofit school.[1003]
- 2014年（43岁）——联合创办在线非营利学校Astra Nova。[1003]
- 2015 (AGE 44)—First reusable orbital rocket booster landed by SpaceX.[1004]
- 2015年（44岁）——太空探索技术公司完成全球首次可重复使用轨道火箭助推器着陆。[1004]
- 2015 (AGE 44)—Co-founded a nonprofit called OpenAI.[1005]
- 2015年（44岁）——联合创办非营利人工智能组织OpenAI。[1005]
- 2016 (AGE 45)—Co-founded Neuralink.[1006]
- 2016年（45岁）——联合创办脑机接口公司Neuralink。[1006]
- 2017 (AGE 46)—First Tesla Model 3 delivered.[1007]
- 2017年（46岁）——首批特斯拉Model 3完成交付。[1007]
- 2017 (AGE 46)—SpaceX achieved world’s first successful flight of a reused rocket.[1008]
- 2017年（46岁）——太空探索技术公司实现全球首次火箭回收复用发射。[1008]

更多资源 https://mirrorsite.org

- 2020 (AGE 49)—First crewed SpaceX flight carries astronauts to the International Space Station.[1009]
- 2020年（49岁）——太空探索技术公司首次载人飞行任务将宇航员送往国际空间站。[1009]
- 2021 (AGE 50)—Becomes richest person in the world (for the first time).[1010] Named *Time* Person of the Year.[1011]
- 2021 (AGE 50)—Becomes richest person in the world (for the first time).|2021年（50岁）——首次登顶全球首富。[1010]当选《时代》年度人物。[1011]
- 2022 (AGE 51)—Acquired Twitter (now called X) for $44 billion.
- 2022年（51岁）——以440亿美元完成推特（现称X）收购。
- 2023 (AGE 53)—Founded xAI to advance AI development, competing with OpenAI.
- 2023年（53岁）——创立xAI公司推进人工智能研发，与OpenAI形成竞争。
- 2023 (AGE 53)—FDA approved Neuralink for human trials.
- 2023年（53岁）—FDA批准Neuralink进行人体试验。
- 2024 (AGE 54)—First human receives Neuralink brain implant.[1012]
- 2024年（54岁）—首位人类接受Neuralink脑机接口植入。[1012]
- 2024 (AGE 54)—Starship's first-stage booster is caught by launch tower "chopsticks."
- 2024年（54岁）—星舰一级助推器被发射塔「筷子」捕获。
- 2025 (AGE 55)—Created a city called Starbase, Texas.[1013]
- 2025年（55岁）—在德克萨斯州创建名为星舰基地的城市。[1013]
- 2025 (AGE 55)—Net worth exceeded $500 billion in October, the first person to do so.[1014]
- 2025年（55岁）—10月净资产突破5000亿美元，成为达成此成就的第一人。[1014]

983 The Editors of Encyclopaedia Britannica, "Elon Musk," Britannica Money, *Encyclopaedia Britannica*, accessed November 13, 2025, https://www.britannica.com/biography/Elon-Musk.

983 《大英百科全书》编辑团队，"埃隆·马斯克"，《大英百科财经》， *Encyclopaedia Britannica*，访问日期2025年11月13日，https://www.britannica.com/biography/Elon-Musk。

984 Vance, *Elon Musk*.

更多资源 https://mirrorsite.org

984 万斯，埃隆 马斯克。

985 Ashlee Vance, “Elon Musk: The College Years,” *Esquire*, June 5, 2015, https://www.esquire.com/entertainment/books/a35508/elon-musk-college-years-canada-u-penn/.

985 阿什利·万斯，《埃隆·马斯克：大学岁月》，《时尚先生》，2015年6月5日，https://www.esquire.com/entertainment/books/a35508/elon-musk-college-years-canada-u-penn/。

986 Vance, “Elon Musk: The College Years.”

986 万斯，《埃隆·马斯克：大学 时期》

987 Vance, “Elon Musk: The College Years.”

987 万斯，《埃隆·马斯克：大学 时期》

988 Rogan and Musk, “JRE #1609.”

988 罗根与马斯克，《JRE第1609期》

989 “Jeff Skoll Talks with Elon and Kimbal Musk.”

989 “杰夫·斯科尔与埃隆和金巴尔 马斯克的对话。”

990 Mahnoor Khan, “Why Elon Musk Dropped Out of Stanford After Only Two Days,” *Fortune*, February 15, 2022, https://fortune.com/2022/02/15/why-elon-musk-drop ped-out-of-stanford/.

990 玛努尔·可汗，《为何埃隆·马斯克仅入学斯坦福大学两天便退学》，《财富》，2022年2月15日，https://fortune.com/2022/02/15/why-elon-musk-dropped-out-of-stanford/。

991 Vance, *Elon Musk*.

991 万斯，埃隆 马斯克。

992 Vance, *Elon Musk*; Sara-Jayne Slack, “Elon Musk Facts: History, Achievements and Net Worth,” Academy Center, Investing.com, last modified August 21, 2024, https://www.investing.com/academy/statistics/elon-musk-facts/.

992 万斯，埃隆·马斯克；萨拉-杰恩·斯莱克，《埃隆·马斯克数据：历史、成就与净资产》，学院中心，Investing.com，最后更新于2024年8月21日，https://www.investing.com/academy/statistics/elon-musk-facts/。

993 Tom Huddleston Jr., “Elon Musk Slept on His Office Couch and ‘Showered at the YMCA’ While Starting His First Company,” *CNBC*, June 19, 2018, https://www.cnbc.com/2018/06/19/how-elon-musk-founded-zip2-with-his-brother-kimbal.html.

993 小汤姆·赫德尔斯顿，《埃隆·马斯克初创时期睡办公室沙发并在YMCA淋浴》，*CNBC*，2018年6月19日，https://www.cnbc.com/2018/06/19/how-elon-musk-founded-zip2-with-his-brother-kimbal.html。

994 “Third Row Tesla Podcast, Episode 7.”

更多资源 https://mirrorsite.org

994 《特斯拉第三排播客》第 7期

995 US Securities and Exchange Commission, "Form 10-K: PayPal, Inc.," archived August 25, 2020, https://web.archive.org/web/20200825231531/https://www.sec.gov/Archives/edgar/data/1103415/000091205702009834/a2073071z10-k405.htm.

995 美国证券交易委员会，《10-K表格：PayPal公司》，2020年8月25日存档，https://web.archive.org/web/20200825231531/https://www.sec.gov/Archives/edgar/data/1103415/000091205702009834/a2073071z10-k405.htm。

996 Ashlee Vance, "Elon Musk's Space Dream Almost Killed Tesla," *Bloomberg*, May 14, 2015, https://www.bloomberg.com/graphics/2015-elon-musk-spacex/.

996 阿什利·万斯，《埃隆·马斯克的太空梦几乎扼杀特斯拉》，彭博社，2015年5月14日，https://www.bloomberg.com/graphics/2015-elon-musk-spacex/。

997 Vance, *Elon Musk*.

997 万斯，埃隆 马斯克。

998 Matt Burns, "A Brief History of Tesla," *TechCrunch*, October 8, 2014, https://web.archive.org/web/20150717064829/https://techcrunch.com/gallery/a-brief-history-of-tesla/#/slide3.

998 马特·伯恩斯，《特斯拉简史》，TechCrunch，2014年10月8日，https://web.archive.org/web/20150717064829/https://techcrunch.com/gallery/a-brief-history-of-tesla/#/slide3。

999 "Series C: Tesla," Crunchbase, accessed November 13, 2025, https://www.crunchbase.com/funding_round/tesla-motors-series-c--ced5cae2.

999 "C轮融资：特斯拉"，Crunchbase，访问日期2025年11月13日，https://www.crunchbase.com/funding_round/tesla-motors-series-c--ced5cae2。

1000 Berger, *Liftoff*.

1000 伯杰，《升空》。

1001 Drake Baer, "The Making of Tesla: Invention, Betrayal, and the Birth of the Roadster," *Business Insider*, October 31, 2014, https://www.businessinsider.com/tesla-the-origin-story-2014-10.

1001 德雷克·贝尔，"特斯拉的诞生：发明、背叛与敞篷跑车的起源"，《商业内幕》，2014年10月31日，https://www.businessinsider.com/tesla-the-origin-story-2014-10。

1002 John Boudreau, "Tesla Motors Begins Delivering Model S Electric Cars in a Silicon Valley Milestone," *The Mercury News*, June 22, 2012, https://www.mercurynews.com/2012/06/22/tesla-motors-begins-delivering-model-s-electric-cars-in-a-silicon-valley-milestone-2/.

更多资源 https://mirrorsite.org

1002 约翰·布德罗，《特斯拉汽车公司在硅谷里程碑事件中开始交付型号S电动汽车》，《水星报》，2012年6月22日，https://www.mercurynews.com/2012/06/22/tesla-motors-begins-delivering-model-s-electric-cars-in-a-silicon-valley-milestone-2/。

1003 Astra Nova School, accessed November 14, 2025, https://www.astranova.org/.

1003 阿斯特拉新星学校（Astra Nova School），访问日期：2025年11月14日，https://www.astranova.org/。

1004 Mike Wall, "Wow! SpaceX Lands Orbital Rocket Successfully in Historic First," Space.com, December 21, 2015, https://www.space.com/31420-spacex-rocket-landing-success.html.

1004 迈克·沃尔，《哇！太空探索技术公司成功实现轨道火箭历史性首次着陆》，Space.com，2015年12月21日，https://www.space.com/31420-spacex-rocket-landing-success.html。

1005 Cade Metz, "Inside OpenAI, Elon Musk's Wild Plan to Set Artificial Intelligence Free," *WIRED*, April 27, 2016, https://www.wired.com/2016/04/openai-elon-musk-sam-altman-plan-to-set-artificial-intelligence-free/?utm_source=chatgpt.com.

1005 凯德·梅茨，《揭秘OpenAI：埃隆·马斯克解放人工智能的狂野计划》，《连线》，2016年4月27日，https://www.wired.com/2016/04/openai-elon-musk-sam-altman-plan-to-set-artificial-intelligence-free/?utm_source=chatgpt.com。

1006 Sony Salzman et al., "Neuralink's First Brain Implant Patient Feared Device Would Have to Be Removed," *ABC News*, May 17, 2024, https://abcnews.go.com/GMA/Wellness/neuralinks-brain-implant-patient-feared-device-removed/story?id=110325322.

1006 索尼·萨尔兹曼等人，《神经链接首例脑植入患者担心设备会被移除》，《ABC新闻》，2024年5月17日，https://abcnews.go.com/GMA/Wellness/neuralinks-brain-implant-patient-feared-device-removed/story?id=110325322。

1007 Fred Lambert, "Tesla Model 3: Pictures of the Very First Production Unit at the Factory," Electrek, July 9, 2017, https://electrek.co/2017/07/09/tesla-model-3-production-pictures/.

1007 弗雷德·兰伯特，《特斯拉Model 3：工厂首辆量产车实拍图》，Electrek，2017年7月9日，https://electrek.co/2017/07/09/tesla-model-3-production-pictures/。

1008 Fridman and Musk, "Lex Fridman Podcast #400."

1008 弗里德曼与马斯克，《莱克斯·弗里德曼播客#400》

1009 Jackie Wattles, "NASA, SpaceX Launch Astronauts from US Soil for the First Time in a Decade," *CNN*, May 30, 2020, https://edition.cnn.com/2020/05/30/tech/spacex-nasa-launch-astronauts-scn/index.html.

1009 杰基·瓦特尔斯，《美国国家航空航天局与太空探索技术公司十年来首次从美国本土发射宇航员》，*CNN*，2020年5月30日，https://edition.cnn.com/2020/05/30/tech/spacex-nasa-launch-astronauts-scn/index.html

更多资源 https://mirrorsite.org

1010 Sergei Klebnikov, “Elon Musk Is Now the Richest Person in the World, Officially Surpassing Jeff Bezos,” *Forbes*, last modified January 8, 2021, https://www.forbes.com/sites/sergeiklebnikov/2021/01/08/elon-musk-is-now-the-richest-person-in-the-world-officially-surpassing-jeff-bezos/?sh=13de3e433b86.

1010 谢尔盖·克莱布尼科夫，《埃隆·马斯克正式超越杰夫·贝索斯成为世界首富》，《福布斯》杂志，最后更新于2021年1月8日，https://www.forbes.com/sites/sergeiklebnikov/2021/01/08/elon-musk-is-now-the-richest-person-in-the-world-officially-surpassing-jeff-bezos/?sh=13de3e433b86。

1011 Tien Le and Vanessa Romo, “Elon Musk Is Time’s 2021 Person of the Year,” December 13, 2021, https://www.npr.org/2021/12/13/1063792887/elon-musk-time-person-of-the-year.

1011 天乐和瓦妮莎·罗莫报道称："埃隆·马斯克当选2021年《时代》周刊年度人物"，2021年12月13日，https://www.npr.org/2021/12/13/1063792887/elon-musk-time-person-of-year。

1012 Elon Musk (@elonmusk), “The first human received an implant from @Neuralink yesterday and is recovering well. Initial results show promising neuron spike detection,” X, January 29, 2024, https://x.com/elonmusk/status/1752098683024220632.

1012 埃隆·马斯克(@elonmusk)，'首位人类昨日接受@Neuralink植入装置，目前恢复良好。' 初步结果显示神经元尖峰信号检测前景良好，”X平台，2024年1月29日，https://x.com/elonmusk/status/1752098683024220632。

1013 Mike Wendling, BBC News, “Elon Musk’s Starbase in Texas Will Officially Become a City,” *BBC News*, May 4, 2025, https://www.bbc.com/news/articles/c39j8rj4nmmo.

1013 迈克·温德林，《BBC新闻》，“埃隆·马斯克的星舰基地将在德克萨斯州正式建市”，《*BBC*新闻》，2025年5月4日，https://www.bbc.com/news/articles/c39j8rj4nmmo。

1014 Matt Durot, “Elon Musk Just Became the First Person Ever Worth $500 Billion,” *Forbes*, last modified October 2, 2025, https://www.forbes.com/sites/mattdurot/2025/10/01/elon-musk-just-became-the-first-person-ever-worth-500-billion/.

1014 马特·杜罗特，“埃隆·马斯克成为首位身价突破5000亿美元富豪”，《福布斯》，最后更新于2025年10月2日，https://www.forbes.com/sites/mattdurot/2025/10/01/elon-musk-just-became-the-first-person-ever-worth-500-billion/。

更多资源 https://mirrorsite.org

ELON’S RECOMMENDED READING

埃隆推荐读物

Expose yourself to as many smart people as possible. Read a lot of books.[1015]

尽可能多地接触聪明人士，大量阅读书籍。[1015]

更多资源 https://mirrorsite.org

BOOKS

更多资源 https://mirrorsite.org

书籍

(Since there are so many links in this section, you may prefer a digital version. Go to ElonMuskBook.org to get a digital version of this chapter.)

（本节包含大量链接，建议使用电子版。请访问*ElonMuskBook.org*获取本章电子版本。）

FICTION

小说类

The Hitchhiker's Guide to the Galaxy by Douglas Adams

道格拉斯·亚当斯《银河系漫游指南》

This is in fact a book of philosophy, disguised as a silly humor book. If you read it from the standpoint of "Wow, this is an interesting book of philosophy," it is quite insightful. It hits this point: The answer is easy once you can properly formulate the question.[1016]

这实际上是一部披着幽默外衣的哲学著作。若以'这是本有趣的哲学书'的角度阅读，你会发现其中蕴含深刻洞见。其核心观点在于：当你能够正确提出问题，答案自然水到渠成。[1016]

It also makes fun of bureaucracy. Earth essentially gets destroyed by a sort of clerical error. Aliens decide they need an interstellar highway and Earth is in the way. They post the fact that Earth needs to get destroyed for this interstellar highway, but of course, it's posted on an alien bulletin board that no one on Earth can access.[1017]

书中还对官僚制度进行了辛辣讽刺。地球的毁灭本质上源于某种行政疏漏。外星人决定修建星际高速公路，而地球恰在规划路线上。虽然

更多资源 https://mirrorsite.org

拆除地球的公告已发布，但这份通告刊登在地球人无法访问的外星公告板上。[1017]

The Lord of the Rings by J.R.R. Tolkien

魔戒 by J.R.R. Tolkien

I know it's cliché, but *The Lord of the Rings* is my favorite series ever.[1018]

我知道这有点陈词滥调，但魔戒系列确实是我此生最爱。[1018]

Foundation series by Isaac Asimov

基地系列 by 艾萨克·阿西莫夫

I recommend reading the Foundation series. It's about how there's likely to be another dark age, which my guess is there will be at some point. I'm not predicting that we're about to enter a dark age, but that there's some probability we will, particularly if there's a third world war. We want to make sure that there's enough of us as a seed of human civilization somewhere else to bring civilization back and perhaps shorten the length of a dark age.

我推荐阅读基地系列。它探讨了人类可能再次陷入黑暗时代的命题——我个人认为这在某个时间点终将发生。我并非预言我们将立即步入黑暗时代，但存在这种概率，尤其当第三次世界大战爆发时。我们必须确保足够的人类文明火种能在别处延续，以重建文明并缩短黑暗时代的周期。

It's unlikely we'll never have another world war. There probably will be at some point. I'm not predicting this, but given enough time it will be likely because this has been our pattern in the past.[1019]

人类永远不再爆发世界大战的可能性微乎其微，战争终将在某个时间点重现。这不是预言，但根据历史规律，只要时间足够漫长，这种可能性终将成为必然。[1019]

更多资源 https://mirrorsite.org

Dune series by Frank Herbert

沙丘系列（弗兰克·赫伯特著）

The Dune series by Herbert is brilliant. He advocates placing limits on machine intelligence.[1020]

赫伯特的《沙丘》系列堪称杰作。他主张对机器智能施加限制。[1020]

Stranger in a Strange Land by Robert A. Heinlein

异乡异客（罗伯特·海因莱因著）

I like *Stranger in a Strange Land*, although it kind of goes off the rails at the end.[1021]

我欣赏《异乡异客》，尽管结尾略显偏离主线。[1021]

The Moon Is a Harsh Mistress by Robert A. Heinlein

严厉的月球（罗伯特·海因莱因著）

The Machine Stops by E. M. Forster

机器停转（E·M·福斯特著）

An old story by E. M. Forster, worth reading.[1022]

E·M·福斯特的经典之作，值得品读。[1022]

A Game of Thrones by George R. R. Martin

权力的游戏（乔治·R·R·马丁著）

In my opinion, the best books in recent years are by Iain Banks and George Martin.[1023]

更多资源 https://mirrorsite.org

我认为近年最杰出的作品出自伊恩·班克斯与乔治·马丁之手。[1023]

Culture series by Iain M. Banks

文化系列 by 伊恩·M·班克斯

Compelling picture of a grand, semiutopian galactic future. Hopefully it's not too optimistic about the outcome of AI.[1024]

描绘了一幅宏伟、半乌托邦式银河未来的震撼图景。希望它对人工智能结果的预测不要过于乐观。[1024]

Waiting for Godot by Samuel Beckett

等待戈多 by 塞缪尔·贝克特

Have recently come to appreciate the awesome, absurdist humor of *Waiting for Godot*. We so often wait, without knowing why, when, or where.[1025]

最近开始欣赏等待戈多中那种绝妙的荒诞幽默。我们常常在等待，却不知为何而等、何时该等、何处可等。[1025]

Atlas Shrugged by Ayn Rand

阿特拉斯耸耸肩 by 安·兰德

It's a counterpoint to communism and useful as such, but should be tempered with kindness.[1026]

这是共产主义的对立面，作为此类观点有其价值，但应当用仁慈之心加以调和。[1026]

The Fault in Our Stars by John Green

星运里的错by 约翰·格林

更多资源 https://mirrorsite.org

I must admit to liking *The Fault in Our Stars*. Sad, romantic, and beautifully named.[1027]

我必须承认喜欢星运里的错。伤感、浪漫，且命名优美。[1027]

SCIENCES

科学

If the Universe Is Teeming with Aliens…Where Is Everybody? by Stephen Webb

史蒂芬·韦布所著《若宇宙遍布外星人……那为何杳无踪迹？》

Read it when it came out. Great book.[1028]

刚出版时就拜读了，非常棒的书[1028]

The Big Picture*: *On the Origins of Life, Meaning, and the Universe by Sean Carroll

肖恩·卡罗尔所著《大图景：论生命的起源、意义及宇宙》

Highly recommend anything by Sean Carroll.[1029]

强烈推荐肖恩·卡罗尔的任何作品[1029]

The Skeptics' Guide to the Universe: How to Know What's Really Real in a World Increasingly Full of Fake by Steven Novella

史蒂文·诺维拉所著《宇宙疑案指南：如何在虚假信息泛滥的世界明辨真相》

The Selfish Gene by Richard Dawkins

更多资源 https://mirrorsite.org

理查德·道金斯所著《自私的基因》

Most people don’t realize that the origin of the word meme is from this book by Richard Dawkins.[1030]

大多数人不知道meme（模因）一词源自理查德·道金斯的这本书[1030]

Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Climate Change by Naomi Oreskes

娜奥米·奥雷斯克斯所著《贩卖怀疑的商人：一撮科学家如何掩盖从烟草到全球变暖的真相》

The same people who tried to deny smoking deaths are denying climate change.[1031]

那些曾经矢口否认吸烟致死的人，如今又在矢口否认气候变化。[1031]

What We Owe the Future by William MacAskill

《我们欠未来的债》 威廉·麦卡斯基尔著

This is a close match for my philosophy.[1032]

这与我的理念高度契合。[1032]

ROCKET SCIENCE AND ENGINEERING

火箭科学与工程学

Liftoff: Early Days of SpaceX by Eric Berger

《升空：太空探索技术公司早期岁月》 埃里克·伯杰著

This book is accurate.[1033]

更多资源 https://mirrorsite.org

这本书内容准确。[1033]

Ignition!: An Informal History of Liquid Rocket Propellants by John Drury Clark

《点火！：液体火箭推进剂非正式史》 约翰·德鲁里·克拉克著

One of my favorite books for learning space travel.[1034]

这是我最喜爱的太空旅行学习书籍之一。[1034]

Modern Engineering for Design of Liquid Propellant Rocket Engines by Dieter K. Huzel

《液体推进剂火箭发动机现代工程设计》 迪特尔·K·胡泽尔著

Structures: Or Why Things Don't Fall Down by J. E. Gordon

《结构：物体为何屹立不倒》 J·E·戈登著

A good book on structural design. It is really, really good if you want a primer on structural design.[1035]

这是一本关于结构设计的优秀著作。若想获得结构设计入门读物，这本书确实非常出色。[1035]

HISTORY

历史

> Learn the lessons of history so we do not repeat the mistakes of the past.

更多资源 https://mirrorsite.org

> 学习历史教训，以免重蹈覆辙。

The Lessons of History by Will and Ariel Durant[1036]

历史的教训威尔·杜兰特与艾瑞尔·杜兰特合著[1036]

The Story of Civilization by Will and Ariel Durant

文明的故事威尔·杜兰特与艾瑞尔·杜兰特合著

The Story of Civilization will keep you occupied for a long time. *The Age of Napoleon* by Will and Ariel Durant is an amazing book.[1037] *The Life of Greece* is incredible.[1038]

The Story of Civilization will keep you occupied for a long time. *The Age of Napoleon* by Will and Ariel Durant is an amazing book. | 文明的故事会让你沉浸许久。拿破仑时代 威尔·杜兰特与艾瑞尔·杜兰特合著，实属杰作。[1037] 希腊的生活精彩绝伦。[1038]

The Iliad by Homer (Penguin Classics edition)

伊利亚特荷马著（企鹅经典版）

Something that's really good as an audiobook is the Penguin edition of *The Iliad*. *The Iliad* was meant to be a spoken poem so obviously lends itself very well to being an audiobook and Penguin did a great job of narration. It's quite engaging.[1039]

企鹅版伊利亚特的有声读物堪称精品。这部史诗本就为吟诵而生，天然适合有声书形式；企鹅的朗读演绎极为出色，引人入胜。[1039]

The History of the Decline and Fall of the Roman Empire by Edward Gibbon

罗马帝国衰亡史爱德华·吉本著

更多资源 https://mirrorsite.org

Read Gibbon's famous book about the decline and fall of the Roman Empire and how they had advanced technology in terms of roads, aqueduct plumbing, and so forth and then they basically forgot about it.[1040]

阅读吉本关于罗马帝国衰亡的名著，了解他们在道路、引水渠管道等技术领域的高度成就，以及最终如何基本将其遗忘。[1040]

Catherine the Great: Portrait of a Woman by Robert K. Massie

叶卡捷琳娜大帝：女性肖像 罗伯特·K·马西著

An amazingly expansive and compelling portrait of an incredible woman. Highly recommended. Yeah, I know what you're probably thinking…did she really f* a horse?[1041]

这部作品以宏大视角生动刻画了这位非凡女性，极具感染力。强烈推荐。好吧，我知道你大概在想什么...她真的与马交欢过吗？[1041]

Storm of Steel by Ernst Jünger

钢铁风暴 恩斯特·荣格尔著

I was fascinated by Jünger's famous book *Storm of Steel*, which was published roughly a hundred years ago, about Jünger's experiences in the first world war. For some reason I'm fascinated by war and history in general. I thought Jünger's book was an excellent firsthand account of World War I. A lesson taken from this book is we don't ever want to do that again.[1042]

荣格尔百年前出版的钢铁风暴令我深感兴趣，这部著作记录了他在第一次世界大战中的亲历。我对战争与历史始终抱有浓厚兴趣，而此书堪称一战的一手纪实杰作。其核心启示在于：我们绝不应重蹈覆辙。[1042]

Not Much of an Engineer by Sir Stanley Hooker

更多资源 https://mirrorsite.org

算不上工程师斯坦利·胡克爵士著

On War by Carl von Clausewitz

战争论卡尔·冯·克劳塞维茨著

There should be a chapter saying, “If you have a decisive technology advantage, you can actually win with minimal casualties.”[1043]

应设专门章节阐明：“当具备决定性技术优势时，实际上能以最小伤亡代价赢得胜利。”[1043]

The Wages of Destruction: The Making and Breaking of the Nazi Economy by Adam Tooze

毁灭的代价：纳粹经济的兴衰亚当·图兹著

The Fifteen Decisive Battles of the World: From Marathon to Waterloo by Edward Shepherd Creasy

改变世界的十五大战役：从马拉松到滑铁卢爱德华·谢泼德·克里西著

Insightful analysis, ensconced in eloquent prose.[1044]

洞见精辟的分析，蕴藏于雄辩行文之中。[1044]

The Art of War by Sun Tzu

孙子兵法孙子著

An interesting book I’ve read many times.[1045]

一本令我反复品读的佳作[1045]

Benjamin Franklin by Walter Isaacson

本杰明·富兰克林沃尔特·艾萨克森著

更多资源 https://mirrorsite.org

Great biography of Ben Franklin by Isaacson. Highly recommended.[1046]

沃尔特·艾萨克森撰写的本杰明·富兰克林传记堪称典范，强烈推荐。[1046]

Stalin*: *The Court of the Red Tsar by Simon Sebag Montefiore

斯大林：红色沙皇的宫廷 西蒙·塞巴格·蒙蒂菲奥里著

Stalin: The Court of the Red Tsar was one of the few books that was so dark I had to stop reading. If only they'd listened to Lenin's last wish, much tragedy may have been averted.[1047]

斯大林：红色沙皇的宫廷是少数几本内容过于压抑令我不得不中止阅读的作品。若能遵从列宁的临终遗愿，诸多悲剧本可避免。[1047]

American Caesar by William Manchester

美国式凯撒 威廉·曼彻斯特著

Steve Jobs by Walter Isaacson

史蒂夫·乔布斯 沃尔特·艾萨克森著

Explore/Create: My Life in Pursuit of New Frontiers, Hidden Worlds, and the Creative Spark by Richard Garriott

探索/创造：我追求新前沿、隐秘世界与创意火花的人生历程 理查德·加里奥特著

Explore/Create is a chronicle of wonder, and the many wondrous things the future may hold. Richard and I have long shared a passion for space. Perhaps one day our kids will create and play games on a new world![1048]

探索/创造是一部充满惊奇的纪实，展现了未来可能蕴藏的诸多奇迹。我和理查德长久以来都怀有对太空的共同热忱。或许有朝一日，我们

更多资源 https://mirrorsite.org

的孩子将在新世界创造并畅玩游戏！[1048]

The Autobiography of Benjamin Franklin

《本杰明·富兰克林自传》

Autobiographies are really helpful.[1049]

自传确实大有裨益。[1049]

Britannica Concise Encyclopedia

《大英百科全书简编》

Read through the condensed version of the Encyclopedia Britannica; I'd recommend that.[1050]

建议通读《大英百科全书》简编版，我强烈推荐。[1050]

Destined for War: Can America and China Escape Thucydides's Trap?—A Critical Examination of Historical Patterns Leading to War Between Great Powers by Graham Allison

《注定开战：美国与中国能否逃脱修昔底德陷阱？——大国战争历史模式批判性研究》 格雷厄姆·艾利森著

Well, it's worth reading that book on the difficult-to-pronounce Thucydides's trap. I love war history. I like inside out and backward. There's hardly a battle I haven't read about. And trying to figure out what really was the cause of victory in any particular case as opposed to what one side or another claims is the reason. Both the victory and what caused the war.[1051]

那本关于晦涩难读的修昔底德陷阱的著作值得研读，我痴迷战争史。我推崇逆向思维方式。鲜有战役记载能逃过我的阅读。并致力于剖析

特定案例中胜利的真实根源，而非交战方宣称的表面缘由。胜利本身及其战争根源[1051]

Man's Search for Meaning by Victor E. Frankl

维克多·弗兰克尔的《活出生命的意义》

AI AND MACHINE LEARNING

人工智能与机器学习

Life 3.0: Being Human in the Age of Artificial Intelligence by Max Tegmark

马克斯·泰格马克的《生命3.0：人工智能时代的人类存在》

A compelling guide to the challenges and choices in our quest for a great future of life, intelligence, and consciousness—on Earth and beyond.[1052]

这是一部极具说服力的指南，探讨了在追求生命、智能与意识在地球及其他领域实现伟大未来的过程中，我们所面临的挑战与抉择[1052]

Superintelligence: Paths, Dangers, Strategies by Nick Bostrom

尼克·博斯特罗姆的《超级智能：路径、危险、策略》

Worth reading *Superintelligence* by Bostrom. We need to be super careful with AI. It's potentially more dangerous than nukes.[1053]

值得一读博斯特罗姆的《超级智能》。对待人工智能我们必须极度谨慎，其潜在危险性可能超过核武器[1053]

Human Compatible*: *Artificial Intelligence and the Problem of Control by Stuart Russell

更多资源 https://mirrorsite.org

斯图尔特·罗素的《人机兼容：人工智能与控制难题》

Worth reading *Human Compatible* by Stuart Russell (he's great!) about future AI risks and solutions.[1054]

值得阅读斯图尔特·罗素（他非常出色！）所著的《人类兼容》，书中探讨了未来人工智能的风险与解决方案。[1054]

Our Final Invention: Artificial Intelligence and the End of the Human Era by James Barrat

我们的终极发明：人工智能与人类时代的终结作者：詹姆斯·巴拉特

Our Final Invention is also worth reading.[1055]

我们的终极发明也值得一读。[1055]

Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

深度学习 作者：伊恩·古德费洛、约书亚·本吉奥、亚伦·库维尔

Written by three experts in the field, *Deep Learning* is the only comprehensive book on the subject.[1056]

由该领域三位专家合著的深度学习是唯一全面阐述该主题的著作。[1056]

BUSINESS AND ECONOMICS

商业与经济

Screw Business as Usual: Turning Capitalism into a Force for Good by Richard Branson

不寻常的经商之道：将资本主义转化为向善的力量 作者：理查德·布兰森

更多资源 https://mirrorsite.org

I liked *Screw Business as Usual* a lot. This approach should be taken to heart by all, as it really is a smart move.[1057]

我非常喜欢不寻常的经商之道。所有人都应该认真践行这种理念，这确实是明智之举。[1057]

Masters of Doom: How Two Guys Created an Empire and Transformed Pop Culture by David Kushner

末日大师：两个家伙如何创造帝国并改变流行文化 大卫·库什纳 著

Masters of Doom is a great book.[1058]

末日大师堪称经典之作[1058]

The Wealth of Nations by Adam Smith

国富论 亚当·斯密 著

Adam Smith for the win, obviously.[1059]

亚当·斯密的理论当然值得推崇[1059]

Zero to One: Notes on Startups, or How to Build the Future by Peter Thiel

从零到一：初创企业的成功之道 彼得·蒂尔 著

Peter Thiel has built multiple breakthrough companies, and *Zero to One* shows how.[1060]

彼得·蒂尔创建了多家突破性企业，从零到一完整呈现了其方法论[1060]

What's Our Problem?: A Self-Help Book for Societies by Tim Urban

我们的问题何在：社会自助手册 蒂姆·厄本 著

更多资源 https://mirrorsite.org

Lying by Sam Harris

谎言作者：山姆·哈里斯

I read *Lying* by my friend Sam Harris. Excellent cover art and lots of good reasons not to lie![1061]

我读了朋友山姆·哈里斯的谎言。封面设计出色，书中还列举了大量不该撒谎的有力理由！[1061]

The Parasitic Mind: How Infectious Ideas Are Killing Common Sense by Gad Saad

寄生思维：传染性观念如何扼杀常识作者：盖德·萨阿德

The Parasitic Mind is great. He's got a book on happiness as well, which is also quite good. I'm a big fan of Gad Saad.[1062]

寄生思维非常精彩。他还有本关于幸福的书，同样相当出色。我是盖德·萨阿德的忠实粉丝。[1062]

A Woman Makes a Plan: Advice for a Lifetime of Adventure, Beauty, and Success by Maye Musk

女性制胜法则：成就历险、美丽与成功人生的智慧指南作者：梅耶·马斯克

My mom wrote a book. ♥[1063]

我母亲写了本书。❤[1063]

1015 "Tesla AI Day 2022."

1015 "2022特斯拉AI日 "

1016 Krishnan and Ramamurthy, "Elon Musk Clubhouse Interview."

1016 克里希南和拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》

更多资源 https://mirrorsite.org

1017 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

1017 克里希南和拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》

1018 Musk (@elonmusk), X account.

1018 马斯克（@elonmusk），X 账户

1019 “Elon Musk Answers Your Questions,” SXSW 2018.

1019 《埃隆·马斯克回答您的提问》，2018年西南偏南大会

1020 Musk (@elonmusk), X account.

1020 马斯克（@elonmusk），X 账号

1021 Caitlin Shamberg, “Can Elon Musk Fix the 405?,” KCRW, March 19, 2013, https://www.kcrw.com/culture/articles/can-elon-musk-fix-the-405.

1021 凯特琳·沙姆伯格，《埃隆·马斯克能否解决405公路问题？》，KCRW，2013年3月19日，https://www.kcrw.com/culture/articles/can-elon-musk-fix-the-405

1022 Musk (@elonmusk), X account.

1022 马斯克（@elonmusk），X 账户

1023 Musk (@elonmusk), X account.

1023 马斯克（@elonmusk），X 账户

1024 Musk (@elonmusk), X account.

1024 马斯克（@elonmusk），X 账户

1025 Musk (@elonmusk), X account.

1025 马斯克 (@elonmusk)，X 账号

1026 Musk (@elonmusk), X account.

1026 马斯克 (@elonmusk)，X 账号

1027 Musk (@elonmusk), X account.

1027 马斯克 (@elonmusk)，X 账号

1028 Musk (@elonmusk), X account.

1028 马斯克 (@elonmusk)，X 账户。

1029 Musk (@elonmusk), X account.

更多资源 https://mirrorsite.org

1029 马斯克 (@elonmusk)，X 账户。

1030 “Will Smith Hosts Meme Review w/ Elon Musk [MEME REVIEW] #50,” PewDiePie, February 22, 2019, YouTube video, 19:48, https://www.youtube.com/watch?v=zpWYQ1YtgnI&t=1024s.

1030 “威尔·史密斯主持埃隆·马斯克梗图评论 [MEME REVIEW] #50”，PewDiePie，2019年2月22日，YouTube视频，19:48，https://www.youtube.com/watch?v=zpWYQ1YtgnI&t=1024s。

1031 Musk (@elonmusk), X account.

1031 马斯克 (@elonmusk), X 账号

1032 Musk (@elonmusk), X account.

1032 马斯克 (@elonmusk), X 账号

1033 Musk (@elonmusk), X account.

1033 马斯克 (@elonmusk), X 账号

1034 Musk (@elonmusk), X account.

1034 马斯克 (@elonmusk)，X 账号。

1035 “Elon Musk Recommends 12 Books That Changed His Life,” Farnam Street Media, *FS* (blog), 2021, https://fs.blog/elon-musk-book-recommendations/.

1035 《埃隆·马斯克推荐改变他人生的12本书》，法纳姆街媒体，*FS*（博客），2021年，https://fs.blog/elon-musk-book-recommendations/。

1036 Fridman and Musk, “Lex Fridman Podcast #438.”

1036 弗里德曼与马斯克，《莱克斯·弗里德曼播客第438期》。

1037 Musk (@elonmusk), X account.

1037 马斯克 (@elonmusk)，X 账户

1038 Musk (@elonmusk), X account.

1038 马斯克 (@elonmusk)，X 账户

1039 “Elon Musk's NEW EPIC Rant.”

1039 《埃隆·马斯克全新史诗级宣言》

1040 Krishnan and Ramamurthy, “Elon Musk Clubhouse Interview.”

1040 克里希南与拉玛穆尔蒂，《埃隆·马斯克俱乐部会所 访谈》。

更多资源 https://mirrorsite.org

1041 Musk (@elonmusk), X account.

1041 马斯克（@elonmusk），X 账户。

1042 “Birthrate Threat,” WELT Documentary.

1042 《生育率危机》，《世界报》 纪录片。

1043 Carlin and Musk, “Engineering Victory.”

1043 卡林与马斯克，《工程胜利》。

1044 Musk (@elonmusk), X account.

1044 马斯克 (@elonmusk)，X平台账户。

1045 Carlin and Musk, “Engineering Victory.”

1045 卡林与马斯克，《工程胜利》。

1046 Musk (@elonmusk), X account.

1046 马斯克 (@elonmusk)，X 账号。

1047 Musk (@elonmusk), X account.

1047 马斯克 (@elonmusk)，X 账号。

1048 Richard Garriott and David Fisher, *Explore/Create: My Life in Pursuit of New Frontiers, Hidden Worlds, and the Creative Spark* (William Morrow, 2017).

1048 理查德·加里奥特与大卫·费舍尔，《探索/创造：我追求新领域、隐藏世界与创意火花的生活》（威廉·莫罗出版社，2017年）。

1049 “Elon Musk and Kevin Rose,” Kevin Rose, September 7, 2012, YouTube video, 26:42, https://www.youtube.com/watch?v=L-s_3b5fRd8.

1049 “埃隆·马斯克与凯文·罗斯”， 凯文·罗斯， 2012年9月7日， YouTube视频， 26:42，https://www.youtube.com/watch?v=L-s_3b5fRd8。

1050 Fridman and Musk, “Lex Fridman Podcast #252.”

1050 弗里德曼与马斯克，《莱克斯·弗里德曼播客第252期》。

1051 Fridman and Musk, “Lex Fridman Podcast #400.”

1051 弗里德曼与马斯克，《莱克斯·弗里德曼播客第400期》。

1052 Max Tegmark, *Life 3.0: Being Human in the Age of Artificial Intelligence* (Vintage Books, 2017).

更多资源 https://mirrorsite.org

1052 马克斯·泰格马克，《生命3.0：人工智能时代的人类生存》（Vintage Books，2017）。

1053 Musk (@elonmusk), X account.

1053 马斯克（@elonmusk），X 账户。

1054 Musk (@elonmusk), X account.

1054 马斯克（@elonmusk），X 账户。

1055 Musk (@elonmusk), X account.

1055 马斯克 (@elonmusk)，X 账号。

1056 Ian Goodfellow et al., *Deep Learning* (MIT Press, 2016).

1056 伊恩·古德费洛 等，深度学习（麻省理工学院出版社，2016年）。

1057 Musk (@elonmusk), X account.

1057 马斯克 (@elonmusk)，X 账号。

1058 Musk (@elonmusk), X account.

1058 马斯克 (@elonmusk)，X 账户

1059 Musk (@elonmusk), X account.

1059 马斯克 (@elonmusk)，X 账户

1060 Peter Thiel and Blake Masters, *Zero to One: Notes on Startups, or How to Build the Future* (Crown Business, 2014).

1060 彼得·蒂尔与布莱克·马斯特斯，《从零到一：初创企业的生存法则与未来构建之道》（皇冠商业出版社，2014年）

1061 Musk (@elonmusk), X account.

1061 马斯克 (@elonmusk)，X 账号。

1062 “Elon Musk's NEW EPIC Rant.”

1062 《埃隆·马斯克全新史诗级长篇吐槽》

1063 Musk (@elonmusk), X account.

1063 马斯克 (@elonmusk)，X 账号。

更多资源 https://mirrorsite.org

WANT MORE?

想要获取更多内容？

There are many ways to dive more deeply into Elon's ideas. Go to ElonMuskBook.org for bonus chapters, audiobooks, interviews, and more.

深入探索埃隆的理念有多种途径。访问ElonMuskBook.org获取附加章节、有声读物、访谈等延伸内容。

You might also appreciate my previous books, *The Almanack of Naval Ravikant: A Guide To Wealth and Happiness* and *The Anthology of Balaji: A Guide to Technology, Truth, and Building the Future*.

您可能也会对我的前作感兴趣：《纳瓦尔宝典：财富与幸福指南》和《巴拉吉选集：技术、真相与未来构建指南》。

If you love the illustrations in this book, created by Jack Butcher, find more of his illustrations and much more of his work at VisualizeValue.com.

若喜爱本书中杰克·布彻创作的插图，请访问VisualizeValue.com探索更多作品集。

To learn about similar ideas, concepts, technologies, companies, and investments, join my email list at EJorgenson.com and subscribe to the podcast *Smart Friends*.

欲了解相关理念、概念、技术、公司及投资动态，请通过EJorgenson.com加入邮件列表，并订阅播客《*Smart Friends*》。

更多资源 https://mirrorsite.org

APPRECIATION

致谢

There are always more names in the back of the book than there are on the front. Thank you to all who generously gave their time, expertise, wisdom, and skill to create this book.

书后名单总比封面名单长感谢所有慷慨贡献时间、专业知识、智慧与技能共创此书的人们

It’s staggering to think how many talented people left their fingerprints on these pages. I’m grateful to every one of you.

如此多才华横溢者在此书留下印记，实令人惊叹对诸位，我深表感激

Thank you first to Elon, for allowing and encouraging this project. I’m honored by the opportunity to build something around your ideas. I appreciate your trust, generosity, and support.

首先要感谢埃隆允许并鼓励此项目能围绕您的思想构建内容，我深感荣幸感激您的信任、慷慨与支持

I am grateful to Naval for writing the foreword to this book. You put into words every hope that I had for the impact this book could have, and it meant the world to me. Thank you for kicking off this writing adventure, supporting this book, and being you.

更多资源 https://mirrorsite.org

感谢纳瓦尔为本书撰写前言您道出了我对本书影响力的所有期待，此言对我意义非凡。感谢您开启此次写作之旅，支持本书创作，并始终如一的您

I am grateful for a fantastic editor in Rachel Jepsen, and the supportive team at Scribe Media, in particular my publishing manager, Emmy Koziak, for her patience and flexibility.

感谢杰出编辑雷切尔·杰普森，以及Scribe Media团队的支持，特别感激出版经理艾美·科齐亚克的耐心与灵活性

I'm grateful to Dylan Kurt for reaching out and taking on the thousand-and-one tasks that shaped this book and every word in it.

感谢迪伦·库尔特主动联系并承担了书中数不胜数的任务，这些任务塑造了本书及其字字句句。

I am grateful to Jack Butcher for lending his immense talents once again. The illustrations and visuals in this book are entirely his. He clarifies and elevates every idea he touches. He's a living example of these ideals. Thank you for taking this project on in addition to all of your own. I appreciate your talent, kindness, and heart.

我感激杰克·布彻再次贡献其卓越才华。本书插图与视觉内容皆出自他手。凡经他润色的理念，皆得到升华与明晰。他正是这些理念的鲜活典范。感谢你在诸多个人项目之外承接此任务。我珍视你的才华、善意与真心。

I am grateful to Sam Teller, John Durant, and Sky King for their unique shows of faith in this project and me personally. You are deeply appreciated for your generosity and care.

感谢山姆·泰勒、约翰·杜兰特和天空之王对此项目及我个人的独特信任。诸位的慷慨与关怀令我铭感五内。

更多资源 https://mirrorsite.org

I am grateful to all of the fantastic interviewers and writers who created the building blocks of this book. I learned something from all of you, and I appreciate you creating and sharing excellent work.

感谢所有杰出采访者与撰稿人为本书奠定基石。诸位皆使我获益匪浅，感激你们创作并分享如此卓越的作品。

I remain grateful to my parents for every gift, effort, and sacrifice that put me in a position to create this book. You lovingly built the foundation for everything I ever do, and I'll never forget that.

我始终感激父母给予的每一份馈赠、付出的每一分努力和作出的每一次牺牲，正是这些让我能够创作本书。您们以爱筑就了我一切成就的根基，此恩永铭于心。

I am grateful for my wife, Jeannine Jorgenson, for being extremely patient with the amount of time this required. This book wouldn't exist without your wise counsel, positivity, and encouragement. I appreciate all the love and care you bring to our family that allows me to work on quests like this. Thank you for always keeping morale high.

感谢妻子珍妮·乔根森（Jeannine Jorgenson）在此过程中展现的极大耐心。若无您睿智的建言、积极的态度与持续的勉励，本书将无从问世。感激您为家庭倾注的关爱与付出，使我得以投身于此项志业。感谢您始终提振团队士气！

I am grateful for author friends who share their expertise and without whom I'd have more confusion and less laughter: Max Olson, Taylor Pearson, James Clear, and Morgan Housel.

感恩分享专业洞见的作家同仁：马克斯·奥尔森、泰勒·皮尔逊、詹姆斯·克利尔与摩根·豪塞尔，诸君相助令我少困惑多欢笑。

I am grateful to my vast crew of beta readers for their time, opinions, and wise advice. Every one of you made valuable contributions to this book, and it wouldn't be what it is without you. My deepest appreciation for each

更多资源 https://mirrorsite.org

of you: David Senra, George Mack, Ruchir Jajoo, Amanda Orson, Patrick Finley, Alex Wiekowski, Sky King, Megan Darnell, Chase Ilten, Sean Devine, Sean O'Connor, Travis Stoliker, Brady Kurt, Emma Varvaloucas, Raffi Grinberg, Alec Gewirtz, Danielle Krischik, Rame Adi, Everest Brady, Daniel Doyon, Scott Norman, Mitchell Baldridge, Sam Hinkie, Jimmy Donaldson, and Nat Eliason.

感激众多试读团队成员奉献的时间、见解与真知灼见。本书凝聚了诸位宝贵贡献，无此则难成今日面貌。谨致深切谢忱：戴维·森拉、乔治·麦克、鲁奇尔·贾朱、阿曼达·奥尔森、帕特里克·芬利、亚历克斯·维科斯基、天空之王、梅根·达内尔、蔡斯·伊尔滕、肖恩·德瓦恩、肖恩·奥康纳、特拉维斯·斯托利克、布雷迪·库尔特、艾玛·瓦瓦卢卡斯、拉菲·格林伯格、亚历克·格维茨、丹妮尔·克里希克、拉姆·阿迪、埃弗雷斯特·布雷迪、丹尼尔·多扬、斯科特·诺曼、米切尔·鲍德里奇、萨姆·辛基、吉米·唐纳森及纳特·埃利亚森。

I remain grateful to Naval Ravikant and Balaji Srinivasan for trusting me to create what became *The Almanack of Naval Ravikant* and *The Anthology of Balaji*. Both were life-changing projects that led to this opportunity.

我仍对纳瓦尔·拉维坎特和巴拉吉·斯里尼瓦桑心怀感激，他们信任我创作了《纳瓦尔宝典》和《巴拉吉选集》。这两部作品都是改变生命的项目，正是它们促成了此次合作机会。

I am grateful to Ivan Edgar Garcia, my assistant who faithfully supported me in creating this book and, by taking on many responsibilities, gave me more time to work. (Shout-out to Athenafor making this partnership possible!)

感谢我的助理伊凡·埃德加·加西亚，在本书创作过程中他尽心竭力地支持我，主动承担多项职责，为我腾出更多工作时间。(特别感谢Athena促成此次合作！)

I am grateful to the authors and creators who inspired this book. My drive to create and share this book came out of a deep appreciation for the life-

更多资源 https://mirrorsite.org

changing impact of similar books, a few of which I'd like to name specifically:

我由衷感谢那些启发本书创作的作者与思想者。我创作并分享这本书的动力，源于对同类书籍改变人生影响的深深感激，其中特别值得提及的有：

- *Poor Charlie's Almanack* by Peter Kaufman (of Charlie Munger's work)
- 《穷查理宝典》 彼得·考夫曼（整理查理·芒格思想）
- *Zero to One* by Blake Masters (of Peter Thiel's work)
- 《从零到一》 布莱克·马斯特斯（阐述彼得·蒂尔思想）
- *Seeking Wisdom* (and others) by Peter Bevelin (of Buffett and Munger's work)
- 《探索智慧》（及其他著作） 彼得·贝弗林（解读巴菲特与芒格思想）
- *Berkshire Hathaway Letters to Shareholders* by Max Olson (of Buffett's work)
- 伯克希尔·哈撒韦股东信 作者：马克斯·奥尔森（巴菲特著作）
- *Principles* by Ray Dalio (and team)
- 原则 作者：瑞·达利欧（及团队）

I am grateful for the support of many friends and strangers online who supported and encouraged me throughout this project. My DMs overflow with kind words and eager inquiries. I appreciate every gesture. Your energy helped pull me through the thousand-plus hours it took to create this for you.

我由衷感谢众多朋友和陌生网友的支持，是你们在整个项目期间给予我鼓励与帮助。我的私信箱里满是暖心话语和热切咨询。每一份善意都令我感激。正是你们的热情支撑着我投入一千多个小时，为你们完成这份作品。

更多资源 https://mirrorsite.org

ABOUT THE AUTHOR

关于作者

ERIC JORGENSON writes and podcasts about technology, startups, and crafting a bright future. His blog has educated and entertained more than one million readers since 2014. Eric invests in early-stage technology companies. (Please get in touch to invest or pitch a company.) **埃里克·乔根森** 专注于撰写科技与初创企业领域的文章及播客，探索构建光明未来之路。自2014年以来，他的博客已启迪并愉悦了超过100万读者。埃里克主要投资于早期阶段的技术公司。（欢迎联系我们进行投资或推介项目。）

He is also the author of *The Almanack of Naval Ravikant*, which has been read by millions of people and translated into forty-plus languages to date, and *The Anthology of Balaji*. He lives in Kansas City with his brilliant wife, Jeannine and son, Archer. Join the author's email list for more good ideas and special projects at EJorgenson.com.

他还是《纳瓦尔宝典》的作者，该书已被数百万人阅读并翻译成四十多种语言；同时著有《巴拉吉选集》。他与聪慧的妻子珍妮及儿子阿彻定居于堪萨斯城。访问EJorgenson.com加入作者邮件列表，获取更多真知灼见与特别企划。